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THE USE OF ISINGLASS AS A BLOOD SUBSTITUTE IN HÆMORRHAGE AND SHOCK*

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THERE has always been the need for a suitable transfusion material of non-human origin, and in war time the search for such a substitute for blood receives a new impetus. At the present time the need is pressing, for in the anticipation of heavy casualties in the coming months there is a genuine fear that the supply of blood or serum may be insufficient to satisfy the demand which may arise. It would seem therefore to be a wise precaution to have a store of an artificial material in reserve for any emergency. Isinglass has shown itself to be a safe and effective transfusion material. The supply of raw material is virtually unlimited and it can now be manufactured relatively cheaply on a large scale.

Nearly two years ago the results of an experimental investigation into the use of a solution of isinglass as a blood substitute were published.¹ A small series of clinical trials of this material was also reported upon at that time. The clinical administrations were in the nature of tests for toxicity rather than for therapeutic purposes. Though in none of these patients, nor in any treated since, was a toxic reaction observed, a few gave a moderate, brief rise in temperature.

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The material used in this first series of experiments and in the earlier clinical cases was prepared from commercial isinglass. In order to be independent of a commercial source of supply and to secure uniformity of our raw material, we turned to the use of dried hake sounds which we had shipped to us from the Atlantic coast. All the isinglass used in the present series of experiments was prepared from this source.

Isinglass is often referred to as fish gelatin. It is more correctly a collagen. Collagen after prolonged heating in aqueous solution undergoes hydrolysis and becomes converted to gelatin. In the preparation of isinglass the fish sounds are subjected to heat for a relatively short period and it is probable that the resulting product is composed very largely of collagen rather than of gelatin. It will be realized that the efficiency of any material with respect to maintaining the volume of circulating fluid depends upon the size and shape of its molecule in relation to the "pores" of the membrane forming the walls of the capillaries. We have no precise information regarding the size and shape of the collagen molecule though presumably it is considerably larger and probably of a more elongated shape than the gelatin molecule. Determinations of the weight of the latter by various investigators ranges from 10,000 or less to 90,000 or more.

It must be remembered, however, that determinations of the molecular size of a colloid material such as collagen or gelatin by osmotic or other physico-chemical methods give only a rough guide as to its suitability for transfusion. The aggregation of the molecules and consequently the particle size, upon which the osmotic pressure depends, are affected profoundly by conditions *in vivo*, namely, pH, temperature, electrolyte concentration and the presence of other colloids and organic compounds. Conditions in the blood stream are very difficult, if not impossible, to imitate *in vitro*. Nor is it probable

that the membranes used in osmotic pressure determinations resemble very closely the capillary membrane in respect to semipermeability. Therefore, though osmotic pressure determinations and other physico-chemical measurements are of value in making a choice of a transfusion material for trial and as criteria for assuring uniformity of manufacture, the final decision as to its effectiveness as a blood substitute must rest upon physiological experiments and clinical experience. The molecular weight of serum albumin upon which the oncotic pressure of the plasma largely depends, namely about 70,000, and which in a 5% solution exerts an osmotic pressure of from 25 to 30 mm. Hg., is assumed to be the ideal one for a transfusion material. But this assumption may not be altogether warranted. It is probable that, in certain circumstances at any rate, the blood volume may be restored as rapidly and be as effectively sustained by a blood substitute possessing a molecular weight considerably less than that of plasma albumin. In other circumstances an osmotic pressure greater than that exerted by normal plasma or serum may be desirable, an effect which may be obtained by increasing the concentration of the transfusion solution.

In so far as the retention of a material in the vascular system and the osmotic pressure which it exerts in the capillary circulation are concerned the shape of the molecule is of great importance. This fact is often lost sight of. A molecule with an elongated shape will pass less readily through the capillary wall than another of the same size but of a symmetrical globular form. Collagen is classed among the fibrous proteins whose molecules have a much greater length than breadth. The molecules of serum albumin, on the other hand, are globular in form. The molecules of the former then, even though of lower weight than those of the latter, will, it is to be expected, pass less freely from the circulation and will therefore exert a greater osmotic pressure than their weight might suggest.

It is generally recognized that a material such as sodium chloride or glucose whose molecule is of such a size that it passes freely from the vascular system is of very limited usefulness in hæmorrhage or shock. Nevertheless, a blood substitute, other than one of human origin, should remain in the circulation only for a sufficient length of time to tide the patient over that period during which the body's compensatory

mechanisms are acting to restore the blood volume and blood pressure to normal. A moderately severe but non-fatal hæmorrhage, if left untreated, is very quickly followed by dilution of the blood by fluid drawn into the vessels from the extravascular tissues. Thus the blood volume is restored and the blood pressure soon rises above the danger level. Plasma protein is regenerated within a remarkably short time but the corpuscular concentration takes several days to return to normal. A blood substitute should aid and in no way interfere with the natural processes leading to the restoration of normal functions; on general grounds, it seems undesirable that one of other than human origin should remain in the circulation beyond the time necessary for these physiological readjustments to become fully established.

The true criterion of the effectiveness of a blood substitute is therefore the restoration of the blood volume and its maintenance to the time when a fluid produced by natural processes can take its place. If the blood dilution resulting from the transfusion is well sustained, the latter has served its purpose. Isinglass disappears from the circulation at a fairly rapid rate, but not apparently until it has been replaced by plasma protein, for the degree of blood dilution shows little change from the post-transfusion level over a period of many hours (see Fig. 4 and Table I).

ACUTE HÆMORRHAGE TREATED WITH A SOLUTION OF ISINGLASS

Twenty-eight dogs were used in this series of experiments. The animals were anaesthetized with ether. A large cannula was inserted into each femoral artery and into the femoral vein of one side. The blood pressure was recorded on a kymograph from one femoral artery and the animal bled from the artery of the opposite side, the blood being collected into a graduated vessel. Bleeding was rapid, being complete in most instances within 8 or 10 minutes. When the blood pressure had reached a low level, usually below 25 mm. Hg., the blood escaped very slowly or ceased to flow. The respirations at this time as a rule became gasping in character and in many instances stopped, the animal then requiring artificial respiration. In several cases the heart beat could not be palpated nor observed in the blood pressure tracing. When the animal reached this critical state a 4% or in some instances a 6% solution of isinglass was

TABLE I.
TRANSFUSION OF AN ISINGLASS SOLUTION FOLLOWING ACUTE HEMORRHAGE

Dog No.	Weight kg.	Hematocrit cell volume %		Red blood cells million per cu. mm.		Blood volume calc. from hematocrit		Blood removed and isinglass solution transfused	Sedimentation rate mm. per hour		Per cent of blood volume	Blood pressure mm. Hg.			Remarks
		Before bleed- ing	After trans- fusion	Before	After	c.c.	% body weight		Before bleed- ing	After trans- fusion		Before bleed- ing	End of bleed- ing	After trans- fusion completed	
1	19.0	38.1	18.9	..	..	1,687	9.3	860	..	..	51	160	18	156	Uneventful and complete recovery.
2	24.0	53.6	26.4	..	..	2,463	10.8	1,260	..	..	51	170	24	158	Uneventful and complete recovery.
3	21.0	47.1	18.3	..	..	1,964	9.8	1,210	..	..	62	150	23	138	Uneventful and complete recovery.
4	21.0	53.0	18.4	..	..	1,990	9.9	1,310	..	..	66	155	24	150	Uneventful and complete recovery.
5	17.1	51.9	16.7	..	..	1,399	8.6	960	..	..	68	140	8	128	Uneventful and complete recovery.
6	17.2	50.0	21.3	2.00	0.860	1,304	7.9	760	1.7	12.1	58	130	24	110	Died during night.
7	24.0	30.6	10.2	6.07	2.52	1,815	7.9	1,210	36.0	41.0	66	140	20	130	Died during night. Dog anemic. Red cell volume only 10.2 after transfusion. At end of bleeding animal stopped breathing and heart action became imperceptible.
8	21.5	37.4	18.2	9.33	2.84	1,597	7.8	830	24.2	35.7	52	140	6	140	Uneventful and complete recovery.
9	28.2	49.6	20.5	10.28	3.28	2,079	7.9	1,230	35.7	35.5	59	160	23	138	Uneventful and complete recovery.
10	18.0	48.5	20.7	7.36	3.53	1,307	7.1	760	2.0	13.25	58	160	28	120	Uneventful and complete recovery.
11	28.0	57.1	27.3	9.00	4.85	1,916	7.2	1,010	0.5	31.0	53	152	8	145	Uneventful and complete recovery.
12	19.0	51.5	17.8	7.81	3.00	1,313	7.2	875	3.5	..	66	160	20	138	Uneventful and complete recovery.
13	19.0	49.7	16.8	7.22	2.62	1,269	7.0	855	11.75	38.25	67	160	16	138	Uneventful and complete recovery.
14	15.0	41.4	15.9	7.64	2.47	1,161	8.1	715	..	..	61	158	24	142	Died 5 hours after transfusion.
15	15.0	45.6	..	..	..	1,200	..	715	..	..	60	150	18	80	Died suddenly shortly after commencement of transfusion from heart failure. Too rapid transfusion thought cause of death.
16	17.0	47.7	14.6	9.95	2.744	1,262	7.8	785	33.75	41.75	62	152	22	156	Uneventful and complete recovery.
17	12.0	46.1	20.3	7.648	2.968	1,115	9.8	635	..	..	56	138	20	128	Uneventful and complete recovery.
18	14.0	52.4	20.4	8.612	3.128	983	7.4	610	..	..	62	128	26	130	Uneventful and complete recovery.
19	15.0	..	..	..	..	1,200	..	610	..	..	51	140	8	..	Died on table before transfusion completed.
20	30.3	50.3	16.3	8.228	2.376	1,849	6.5	1,260	..	..	68	150	12	138	Uneventful and complete recovery.
21	18.2	47.2	17.7	6.512	2.464	1,202	7.0	750	..	..	62	152	22	152	Uneventful and complete recovery.
22	20.0	53.4	..	10.2	..	1,600	..	740	..	..	47	150	23	..	Died on table during transfusion. This animal stopped breathing before bleeding and again during bleeding. Died of respiratory failure shortly after transfusion commenced. Artificial respiration and adrenalin injections failed to resuscitate.
23	12.0	45.3	20.3	8.720	3.976	688	6.0	390	..	..	57	144	8	150	Uneventful and complete recovery.
24	19.25	50.3	15.7	8.260	2.920	1,221	6.7	860	..	..	70	148	22	142	Uneventful and complete recovery.
25	8.4	47.7	13.8	8.952	2.564	506	6.3	360	..	..	71	158	22	160	Uneventful and complete recovery.

*24 hrs.

immediately run into the femoral vein at a rapid rate (3 or 4 c.c. per kilo per minute) and in an amount equal to that of the blood which had been lost. The quantity of blood removed varied in different animals from 47 to 71% of the blood volume. Three animals died from circulatory failure before transfusion could be started.

In the series of experiments reported previously we found that animals varied widely with respect to the proportion of the blood volume, calculated as 8% of the body weight, which it was necessary to remove to cause death. The blood pressure was found to be a more reliable guide to the severity of the hæmorrhage. We therefore came to the conclusion that the blood volume was probably not the same percentage of the body weight in the different animals. In the present series we have calculated the blood volume of each animal from the degree of blood dilution as determined by the

In none of the bled animals was any treatment undertaken other than the administration of isinglass solution.

The results of the treatment of acute hæmorrhage with isinglass solution are shown in Table I and a typical blood pressure tracing in Fig. 1. The three animals which died before being transfused are not included in the Table.

TRAUMATIC SHOCK

Some authorities (*e.g.* Blalock²) draw no essential distinction between hæmorrhage and traumatic shock, believing that the latter state is due mainly to the loss of blood or of plasma into the damaged part. Such a view implies that the surest way to combat shock is to restore the volume of circulating fluid. Yet the theory of "local fluid loss" advanced by Blalock and his associates as an explanation of the shock state has failed to satisfy many, including the

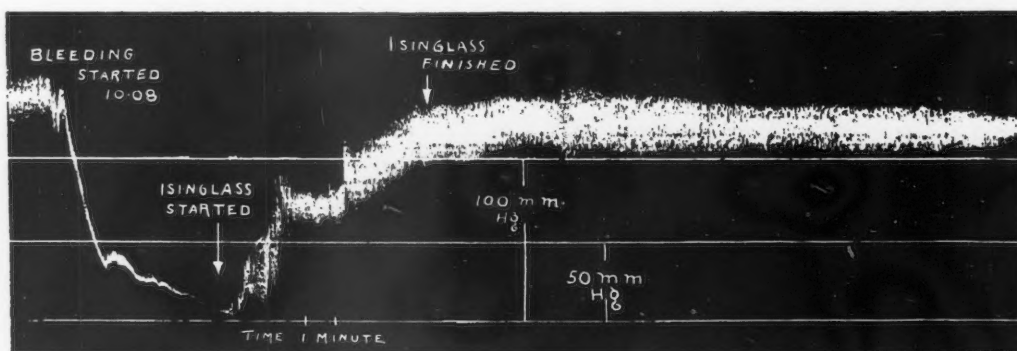


Fig. 1.—Representative tracing showing the effect of the transfusion of isinglass solution upon the blood pressure lowered by acute hæmorrhage.

hæmatocrit just before the injection of the isinglass solution and 5 minutes afterwards. Though admittedly such an estimation is only approximate we believe that it is more accurate than is the use of a constant figure representing a percentage of the body weight. Estimated in this way we have found the blood volume of the animals in the present series of experiments to range from 6.3 to 10.8% of the weight of the animal.

A control series of experiments (*i.e.* of untreated animals) was not undertaken, for from previous experience it is virtually certain that, considering the condition of animals at the time the transfusion was instituted, none would have survived had they not been transfused. In our previous series no untreated animal in which the blood pressure had fallen below 34 mm. Hg. survived. As already mentioned, three animals of the present series died from circulatory failure before transfusion could be started.

authors of this paper. Though admitting that in many instances loss of fluid into the tissues of the damaged part may be a contributing factor, several observations suggest that it is not the main cause of shock.

The production of a substance in the injured tissues acting as a dilator of capillaries *remote* from the wounded region and increasing the permeability of the vessel walls is a conception which was advanced during the last war and is one which several workers in this field are loath to relinquish. This, the so-called *toxæmic theory* of shock, has yet to be proved or disproved. Those who adhere to the toxæmic theory suggest that the reduction in plasma volume which was believed to occur in shock was due to an increase in the permeability of the capillaries throughout the body generally. If an abnormal permeability of the capillaries, whether of a widespread character or confined to the region of injury, were an important

factor in the production of shock, it is quite possible that a blood substitute which is retained within the circulation for a time long enough to raise and maintain the blood pressure after hæmorrhage, might escape from the vessels too freely to be of much value as a restorative in shock. It is to be expected that if plasma itself leaves the circulation, any other substance with a molecule of comparable dimensions to those of the plasma proteins would escape just as readily. On the other hand, if a general enlargement of the vascular bed (through dilatation of capillaries) be the main or even a contributing factor in the shock state, or if loss of blood into the injured tissues be mainly responsible, a transfusion fluid such as isinglass, which has shown itself to be so effective in restoring the blood volume after hæmorrhage, should also be of benefit in shock.

These considerations suggested to us the advisability of studying the effect of this blood substitute in the treatment of traumatic shock. A series of experiments in which the shocked animal was transfused with whole blood was also undertaken. These latter experiments were undertaken with the view of establishing a basis upon which the value of isinglass might be judged.

METHODS

Dogs were used in all these experiments. They were anæsthetized with ether. Shock was produced by the method of Blalock and his associates, namely, by trauma to the thigh (biceps and semitendinosus) muscles inflicted by means of a hammer. Injury to the femur and larger vessels of the limb was avoided in order to minimize the loss of blood into the tissues. From 700 to 1,500 blows, depending upon the weight of the animal, were given to each thigh with a 1½ lb. hammer. In order to avoid breaking the skin the hammer was tipped with a rubber block. From the results of a number of control experiments a fairly accurate standardization of the degree of the injury was established. The blows were given always by the same person, who was able to gauge fairly well their force and rate. One hundred blows per kilogram of body weight were given to each thigh. This number of blows was arrived at by a preliminary series of experiments. It is about the minimum number which could be depended upon to produce shock. When the blows were much fewer than this most of the animals failed to

pass into shock. On the other hand, in no animal receiving 100 blows per kilo to each thigh, did shock fail to develop in from 2 to 4 hours, as evidenced by a fall in blood pressure to 50 mm. Hg. or less. Untreated animals died within a short time thereafter. Blood pressure tracings were taken by means of a cannula inserted into the carotid artery. Blood samples for hæmatocrit determinations were taken from the femoral artery.

In most of these experiments in which an attempt was made to save life by transfusion the blood pressure was allowed to fall to about 50 mm. Hg. or below before the transfusion was commenced. The quantity of transfusion fluid to be injected was calculated upon the assumption that the blood volume had been reduced by 50% or that the vascular capacity (through capillary dilatation) had been increased to a corresponding extent. This basis of calculation was arrived at from a consideration of the results of the previous experiments with hæmorrhage. As a matter of fact, in these latter experiments a loss of 50% of the blood volume caused, as a rule, a fall in blood pressure to a much lower level, namely, 25 to 30 mm. Hg. or less. The loss of circulating fluid in the bleeding experiments occurred, however, much more rapidly than it would occur presumably in shock. A consideration of this fact influenced us in deciding upon 50% rather than a lower percentage as being a fair figure to take in expressing the disparity between the blood volume and the capacity of the vascular system in shock. This estimation is admittedly only a rough guide but it has served the purpose of these experiments. Fifty per cent of the blood volume of man is from 2½ to 3½ litres, which is certainly a larger quantity of fluid than it has been customary to give in a single transfusion. No treatment of any kind other than transfusion was employed in any of these experiments.

RESULTS

Transfusion with whole blood.—Blood amounting to 50% of the calculated blood volume of the shocked animal was drawn from the femoral artery of another dog. After adding 3% of a solution of sodium citrate in the proportion of 9 parts of blood to 1 part of the solution of citrate, it was transfused into the jugular vein of the animal in shock. The blood pressure rose rapidly in most instances to over 100 mm. Hg., then fell sharply by from 20 to 40 mm. Hg.,

at which level it was maintained for a time and then gradually sloped to the shock level. The abrupt rise in blood pressure from the shock level and the equally abrupt decline which occurs immediately afterwards produces a sharp peak in the tracing.

This sharp initial elevation and fall of blood pressure at the commencement of the transfusion is probably largely due to the evanescent action of some vasoconstrictor principle in the transfused blood, for this form of curve is not seen to such a marked degree when isinglass solution is used. With the latter fluid the rise may be quite as abrupt but the blood pressure does not as a rule reach to so high a level and the subsequent decline is absent or much less pronounced. No animal whose blood pressure had fallen to 50 mm. Hg. or lower had its life prolonged for much more than 2 hours by a blood transfusion alone. The results of these experiments are given in Table II. The blood

pressure of dog No. 6 was raised again by the transfusion of isinglass solution after it had fallen a second time to the shock level (Fig. 2) and the animal seemed upon the point of death. Its life was prolonged thereby for nearly an hour. The converse experiment is described under the next heading.

Transfusion with isinglass solution.—The shocked animals, twelve in all, which received a transfusion of isinglass solution are shown in Table III. The degree of injury inflicted upon the animals of this series was as nearly equal to that sustained by those transfused with blood as it was possible to judge. In most instances the animals of this series were in worse condition than were those of the previous group at the corresponding time. In a number of animals after the blood pressure had been in the neighbourhood of 50 mm. Hg. for a few minutes the condition of the shocked animal suddenly became urgent. It ceased to breathe, the heart's

TABLE II.
SHOWING THE RESULTS OF THE TRANSFUSION OF WHOLE BLOOD IN TRAUMATIC SHOCK

Dog No.	Body weight kg.	Calculated blood volume c.c.	Systolic blood pressure mm. Hg.			Volume of transfusion c.c.	Blood cells %		Time of survival after first transfusion	Additional details
			Before shock	In shock	After transfusion		Before shock	In shock		
1	7.0	560	135	50	....	250	31	35	1 hr. 20 min.	Artificial respiration during transfusion. Owing to an error in reading blood pressure tracing transfusion was given before blood pressure had reached the shock level, 15 minutes previously it had been 105 mm. Hg.
2	8.0	640	160	..	120	320	43	54	Killed in 3 hr. 45 min.	
3	7.4	592	135	47	....	300	..	..	Died during transfusion 10 min.	
4	7.2	576	150	52	88 falling rapidly	280	..	..	5 min.	Was on the point of death in 1 hr. 25 min. after blood transfusion, had stopped breathing. Blood pressure fell to very low level; was then transfused with isinglass solution. Blood pressure rose and was maintained for 40 min. (see Fig. 1). Blood cells after isinglass transfusion 24%, shortly before death 25%.
5	7.1	560	150	48	105 falling rapidly to 50 mm.	280	..	..	5 min.	
6	9.0	720	170	50	135	350	37	43	2 hr. 20 min.	
7	7.6	608	140	46	112	300	40	49	2 hr. 13 min.	Two hours after transfusion blood pressure started to fall rapidly and in 10 minutes more had fallen to 25 mm. Hg. Animal stopped breathing, heart beat imperceptible. Artificial respiration and isinglass transfusion raised blood pressure and restored heart beat temporarily. Death occurred in a few minutes.

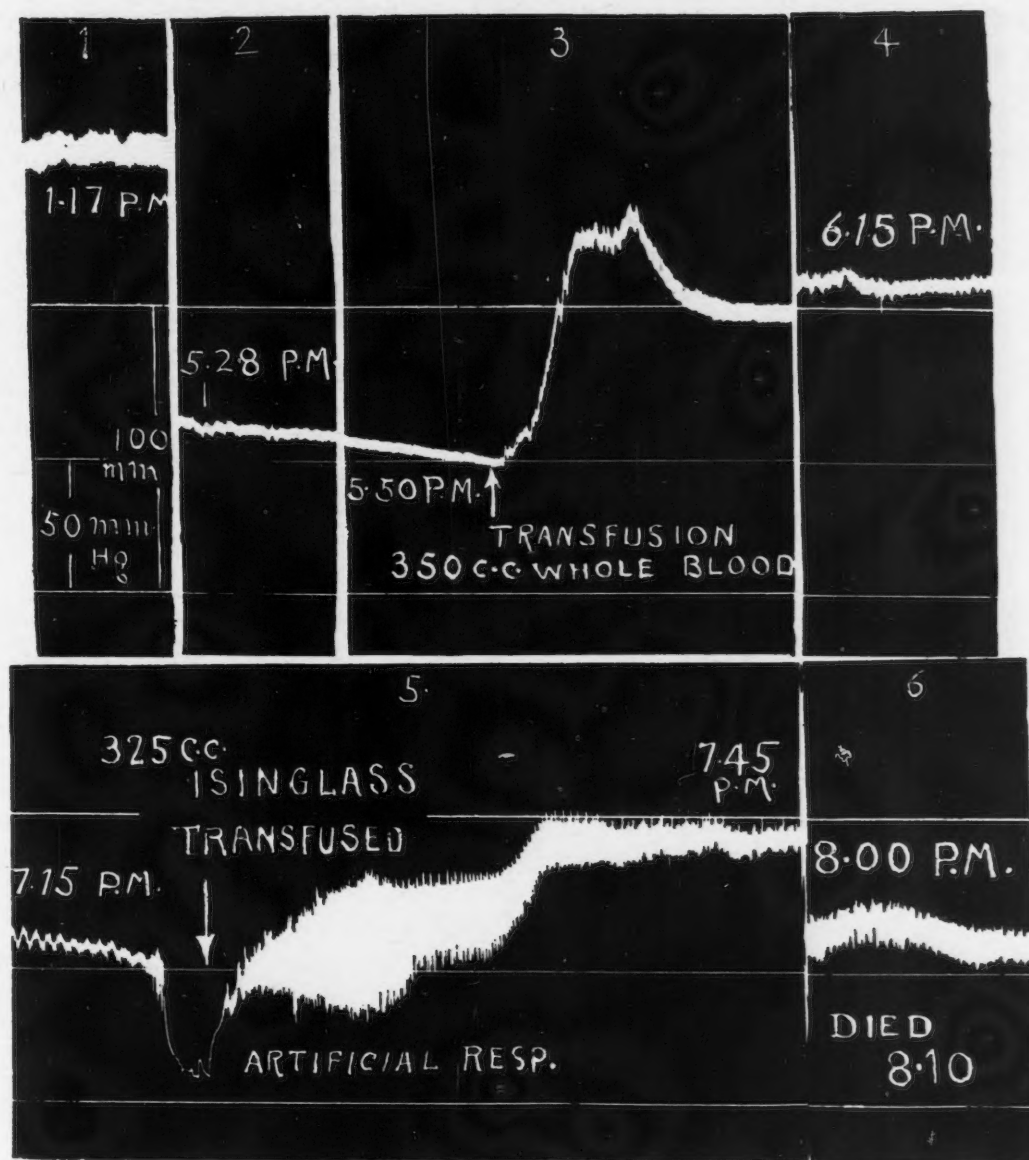


Fig. 2.—Showing the effect of blood transfusion and later isinglass solution on the blood pressure in shocked dog No. 6.

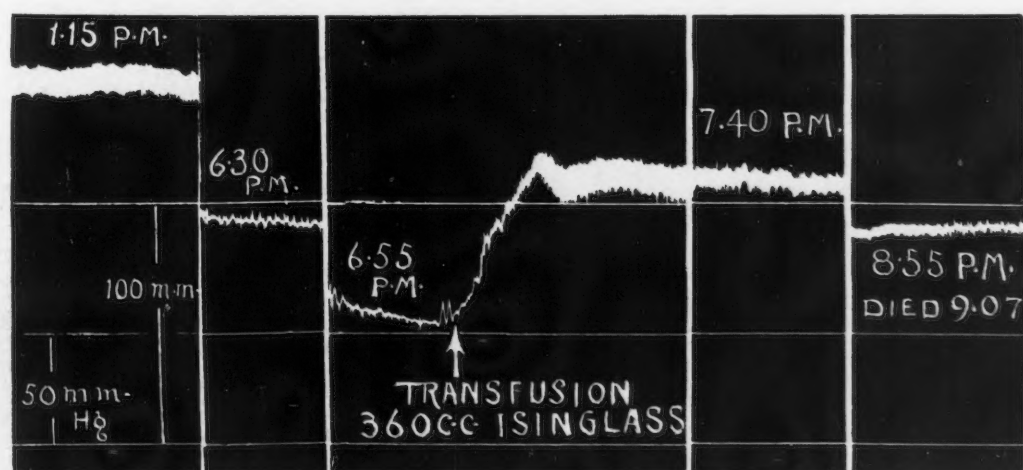


Fig. 3.—Showing the effect of an isinglass solution on the blood pressure of shocked dog.

action became feeble and very slow and the blood pressure showed a further fall of from 5 to 10 mm. Hg. Artificial respiration had then to be instituted while the transfusion fluid was being injected. Often spontaneous respiration was not resumed until the lapse of two or three minutes.

The isinglass solution caused a remarkable response, the respirations becoming deep and regular and the heart's action strong, and the blood pressure rising to over 100 mm. Hg. (see Fig. 3). But, unlike the results of the transfusion of isinglass solution following severe hæmorrhage, the blood pressure was not sustained for very long. As with the transfusion of whole blood, it was found impossible to pro-

long the life of these shocked animals by a single transfusion for little more than 3 hours, and in most instances for not more than 2½ hours. Two animals (Nos. 12 and 13) received a transfusion of blood as the effects of the isinglass transfusion came to an end and the blood pressure was again around the shock level. The results of these experiments did not differ to a significant degree from those of their converse which have been mentioned under the preceding heading. The blood pressure was raised but fell again to the shock level; this was reached in one animal within a few minutes, but not in the other until an hour and a half. Isinglass was then transfused for a second time.

The first thought which comes to mind in ex-

TABLE III.

SHOWING THE RESULTS OF THE TRANSFUSION OF ISINGLASS (7%) SOLUTION IN THE TREATMENT OF TRAUMATIC SHOCK

Dog No.	Body weight kg.	Calculated blood volume c.c.	Systolic blood pressure mm. Hg.			Volume of transfusion c.c.	Blood cells %				Time of survival after first transfusion	Additional details
			Before shock	In shock	After transfusion		Before shock	In shock	After transfusion	At time of 2nd fall in B.P.		
8	12.4	992	165	38	105	500	..	..	..	..	2 hr. 28 min.	
9	17.6	1,408	135	50	100	550	53	58	32	31	2 hr. 14 min.	
10	11.0	880	120	40	110	400	47	51	29	30	3 hr.	Stopped breathing, heart block, animal seemed beyond saving, artificial respiration before and during transfusion.
11	11.2	896	162	48	125	450	48	53	26	29	2 hr. 30 min.	Artificial respiration necessary before and during transfusion.
12	9.2	760	150	40	120	400	39	..	18	18	2 hr. 25 min.	Stopped breathing, artificial respiration for 5 minutes before and during transfusion. Heart rate 15 per minute. Isinglass raised blood pressure and maintained it for 2 hours and 25 minutes, 320 c.c. blood then transfused. Blood pressure raised by 10 mm. only. Death occurred few minutes later.
13	7.5	600	135	48	110	300	51	..	24	25	3 hr. 7 min.	Stopped breathing, artificial respiration required before isinglass given. Blood pressure sustained for 1 hour 32 minutes. Blood then transfused. Blood pressure raised again to 114 mm. Hg. for very brief period then fell to 96 mm. and was sustained fairly well at this level for 1 hour 30 minutes, when animal ceased to breathe and blood pressure fell to shock level. 300 c.c. isinglass solution then transfused. Blood pressure raised again to 90 mm. Hg. Animal died 45 minutes later.
14	17.0	1,360	180	20	..	..	..	..	..	..	....	Stopped breathing and died before transfusion could be given.
15	5.5	440	140	52	105	190	45	50	21	20	36 min.	
16	18.5	1,480	180	50	170	800	66	70	28	26	1 hr. 15 min.	Stopped breathing, artificial respiration, heart action very feeble and slow before transfusion.
17	15.7	1,256	170	42	102	700	55	..	27	29	1 hr. 10 min.	Stopped breathing, artificial respiration, heart action feeble and slow before transfusion.
18	12.8	1,024	182	60	168	550	46	..	25	26	1 hr. 9 min.	
19	8.2	656	160	52	120	330	40	48	28	36	2 hr. 12 min.	See Fig. 2.

planation of the failure of isinglass to save life is that it has escaped rapidly from the circulation, either into the tissues at the site of injury or more generally from highly permeable capillaries throughout the body. However, hæmatocrit determinations (see Table III) made a short time before death and compared with those made shortly after transfusion while the blood pressure was still elevated, lend no support to such a supposition. Blood dilution (as shown by the blood cell percentage) was about the same or only slightly less at the former than at the latter time.

In a later series of experiments rubber elastic bandages were applied to the thighs immediately after injury in order to minimize the limb swelling and to prevent the loss of transfusion fluid into the injured tissues. Animals treated in this way lived no longer than those of the previous series.

THE RESULTS OF TRANSFUSION IN SHOCK CAUSED BY MUSCLE TRAUMA

No satisfactory explanation can be offered for the disappointing results of these experiments. Transfusion has not been able to prolong the lives of shocked animals for more than a short time. The treatment of air raid casualties by transfusion of blood or plasma has also been disappointing.^{3, 4} Similar experiences in France during the last war are on record,^{5, 6, 7} nor are our findings essentially at variance with results of experiments carried out recently by other workers in this field.^{8, 9*}

Under the conditions of our experiments whole blood has shown itself to be no better than a solution of isinglass. The immediate effect of transfusion with either fluid leaves little to be desired. If the animal has stopped breathing and blood or isinglass solution is administered within a few minutes thereafter, the resumption of spontaneous respiration occurs within a few minutes. If the respirations have been shallow, irregular and slow or gasping in character they soon become normal in rate, rhythm and depth.

* While this paper was being prepared a short note by Ivy and his associates appeared in the *Proceedings of the American Physiological Society* (March, 1943, page 17). Experiments similar to ours were described and corresponding results obtained. In these experiments the effectiveness of whole blood and of a solution of gelatin was compared. Gelatin solution and blood were equally effective in raising the blood pressure (from 54 to 135 mm. Hg.). But blood pressure was sustained for only 2¼ hours with either fluid. Saline was relatively ineffective, the blood pressure being raised from 44 to 94 mm. Hg. and sustained for only 45 minutes.

The heart's action shows immediate improvement, the pulse pressure increasing in a remarkable manner. But unfortunately these beneficial effects have been found to be of short duration. The inefficacy of transfusion in the treatment of traumatic shock would appear to be due to some factor, as yet unknown, in the genesis of the shock state which distinguishes the condition fundamentally from hæmorrhage. It is difficult to believe that loss of plasma through highly permeable capillaries is the major factor involved. If this were true one would expect a much greater rise in the blood cell percentage as the blood pressure falls. Moreover, the animal relapses into its previous shocked state usually within three hours or less after transfusion, though the small rise in the corpuscular concentration indicates that the blood volume is still maintained around the normal value.

Our results give no support to the theory that loss of blood fluid into the injured part is the main factor leading to death in traumatic shock. It may be that the most important single factor in the development of shock is a relatively enormous increase in the vascular capacity, such as might result from loss of tone to an extreme degree of the minute vessels throughout the body. One would have to imagine an enlargement of the vascular bed to a degree beyond anything which hitherto has been considered possible. If this should prove to be the true explanation, then the volume of the transfusion in these experiments must have been greatly less than the adequate amount.

It might be contended that the failure of whole blood to prove itself superior to solutions of isinglass in these experiments was due to the injury having been excessively severe, or to transfusion not having been started until shock had developed to the point where no form of treatment could be expected to be effective. The first of these objections seems to have been met by the method of standardization of the injury, which we carried out. The injury which was inflicted on these animals was by no means extreme. It will be recalled that no large vessels or nerves were injured, the skin was not broken, the femur was not struck and the swelling of the bruised area was in most instances moderate. Considering it comparatively with a war casualty, the injury, in so far as one could judge, seemed certainly less severe than that which might be caused by a shell fragment, especially if the femur had been fractured. The second

objection, namely, that treatment was not started soon enough, seems to be answered by the results of a smaller series of experiments, in which the animals were transfused immediately after the injury and before the blood pressure had fallen to the shock level, yet did not survive.

TESTS FOR THE ANTIGENICITY OF ISINGLASS

Ordinary (mammalian) gelatin is an incomplete protein and it is generally admitted that it does not possess antigenic properties. Collagen derived from the swim bladders of fish is believed to resemble closely in chemical constitution collagen or gelatin of mammalian origin. Nevertheless, we have carried out experiments in an attempt to discover whether it were possible to sensitize animals with isinglass. Guinea pigs, dogs, cats and mice have been given second doses of this material at intervals varying from 2 days to several weeks following the first dose. No evidence of sensitization was observed. The guinea pigs, 12 in all, were given isinglass treated with iron alum subcutaneously in the dosage usually employed in testing for foreign protein reaction. The test for antigenicity is rendered more rigid by the preliminary treatment of the isinglass with iron alum (Caulfeild *et al.*¹⁰). The second or "shocking" dose was given intravenously or intracardially 38 days later. The dogs were first bled and then given the usual transfusion dose in order to imitate more closely the conditions under which the material would be used clinically. The second dose was given at periods varying from 2 to 21 days following the first. The blood pressure following the second injection was about the same as that caused by the first. In no instance was a fall in blood pressure observed. A few cats have been given a second injection with similar results, and a very large number of rabbits used for the pyrogen tests were given a number of injections over a period of weeks. Mice also show no ill effects from a second dose at intervals of from 10 to 14 days following the first. Isinglass solution has been administered a second time to several patients; no untoward effect has been observed.

PYROGEN TESTS

As already mentioned, some of the earlier preparations of isinglass caused a rise in temperature in from 15 to 20% of the clinical trials. Realizing that such a high incidence of pyrogenic reactions, even though not severe,

would discourage the use of isinglass as a transfusion material, experiments were undertaken in an attempt to produce a product as free as possible from pyrogenic agents. In testing for pyrogens we have followed with some minor modifications the method of the Public Health Service of the United States. In this test 10 c.c. per kilo of body weight of a 6% solution of isinglass are injected into the marginal ear of each of 5 rabbits. The temperature is taken hourly for 4 hours. If any one of the 5 rabbits shows a rise of more than 1.2° F. within this period the material is discarded. We have found that the pyrogenic action was greatly reduced by autoclaving for 20 minutes at 15 pounds pressure and by more efficient filtering. The pyrogenic reaction of the isinglass as now prepared is usually well below the level of 1.2° F. specified by the test just described, most of the batches of material giving a maximum temperature rise of less than 0.5° F. and an average rise in the 5 test rabbits of from 0.2 to 0.6° F. The clinical use of this improved material has been most satisfactory. The results of the clinical trials will be reported later.

SAFETY TEST

In our experiments a very large number of animals have been employed, including over 150 dogs, 89 cats and 100 rabbits. The rabbits which were used previously for the pyrogen tests received repeated injections from time to time, a total of 650 injections having been administered to the hundred animals. In none of these species was any ill effect observed. In addition, over 400 normal mice have been given injections of isinglass into the tail vein in amounts varying from 60 to 100% of their calculated blood volumes. The animals were observed for one week following the injection, and appeared normal in every respect. There have been only nine deaths, none of which can be attributed to the isinglass. Two of the animals, which were among the first few injected, were suffocated in the box in which they were confined while the injection was being made. The others died soon after transfusion as a result apparently of too rapid injection.

THE REGENERATION OF PLASMA PROTEIN FOLLOWING THE TRANSFUSION OF ISINGLASS

One of the most important of the physiological readjustments following hæmorrhage is the regeneration of plasma protein. A transfusion material should in no way interfere with this

process. Certain artificial blood substitutes, notably gum acacia, have a profoundly depressing effect upon the restitution of plasma protein. The action in this respect of gum acacia is due undoubtedly to its interference with the function of the liver, which becomes greatly enlarged and filled with the foreign material. The concentration of plasma protein N following hæmorrhage and the transfusion of isinglass solution has been followed in 7 animals, and in 2 animals which were bled but not transfused.

The method used for the determination of isinglass nitrogen in the plasma is based upon the fact that isinglass is precipitated by sodium tungstate but not by trichloroacetic acid, whereas the plasma proteins are precipitated by either reagent. A sample of plasma was treated with

curve of plasma protein of the control animal, it will be noted, is more gradual in the first few hours than in the animal which had been transfused. The hæmatocrit curve indicates that at this time dilution with a fluid of low protein content is proceeding. Nevertheless, a comparison of the two curves suggests the possibility that the injected protein is being utilized for the synthesis of plasma protein. Experiments being carried out in this laboratory by Mr. F. N. Hughes give strong indication of the utilization of injected isinglass for the building of body tissue. Rats placed upon a nitrogen-free diet show a progressive loss in weight which is checked and in part regained following the intraperitoneal or intravenous injection of isinglass solution.

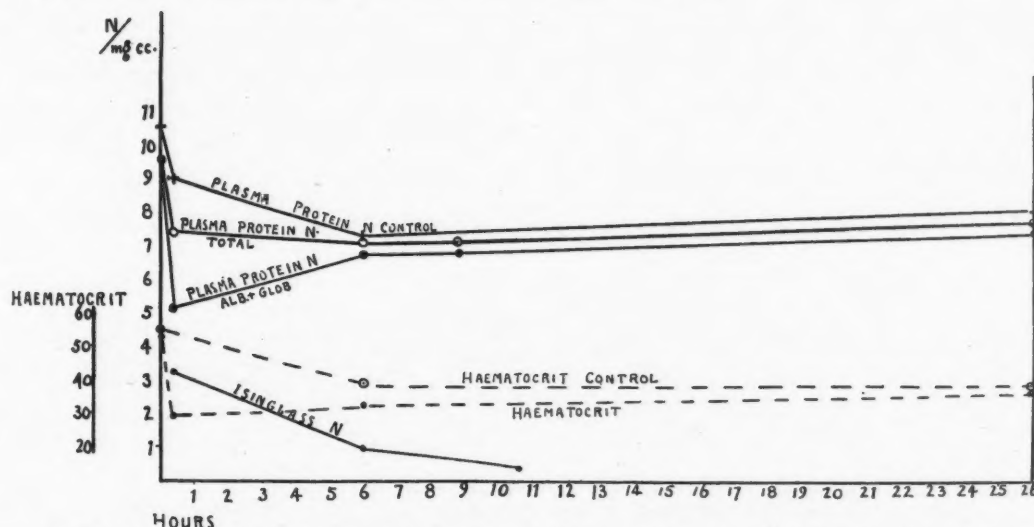


Fig. 4.—Curves of plasma protein regeneration and hæmatocrit determinations following acute hæmorrhage in treated and in untreated (control) animals.

trichloroacetic acid and the nitrogen in the precipitate determined in the Kjeldahl apparatus. The difference between this value and that obtained from the nitrogen determination of an equal quantity of plasma gives the isinglass nitrogen. We are indebted to Dr. Raska who carried out the nitrogen determinations.

As will be seen from Fig. 4, the rates of plasma protein regeneration after the first few hours are not significantly different in the two sets of experiments. An interesting relationship between the disappearance of isinglass from the circulation and the rise in protein concentration of the plasma is illustrated in this figure. It will be seen that there is a reciprocal rise in the plasma protein nitrogen concentration as the isinglass disappears from the blood, the total protein of the plasma (plasma protein plus isinglass) remaining constant. The rise in the

Determinations of plasma protein concentration have been made upon a number of patients receiving transfusions of isinglass. In none was there an indication that the regeneration of plasma protein was interfered with.

The effect of isinglass solution upon hæmoagglutination and the sedimentation rate.—The sedimentation rate of the blood before and after the injection of isinglass was determined in 9 dogs (Table I). In all but one of these animals the sedimentation rate was found to be increased after transfusion. The increase, however, was very moderate and in no case was the rate raised significantly beyond the range shown by the blood samples of the 9 animals taken before transfusion.

Hanging drop specimens of blood were observed for hæmoagglutination. No difference between normal blood samples and those drawn

a few minutes after transfusion was observed.

The histological examination of the organs of animals receiving repeated transfusions of isinglass.—Ten rabbits were given from 3 to 5 transfusions of isinglass solution at intervals of from 1 to 2 weeks. The animals were sacrificed and the liver, kidneys and spleens removed and sectioned. We are indebted to Dr. A. W. Ham and Dr. W. L. Robinson for the histological examination of the sections. No evidence of damage or of deposition of isinglass in the organs of any of the animals was found. A more exhaustive series of experiments in which it is planned to use a larger number of animals and to examine other tissues is under way.

SUMMARY

1. The main requirements of an artificial transfusion material are briefly discussed.

2. The results of a series of experiments demonstrating the value of a solution of isinglass in the treatment of acute hæmorrhage are described. Transfusion either with whole blood or a solution of isinglass has proved relatively ineffective in the treatment of shock caused by muscle damage. The difference between the results of transfusion in acute hæmorrhage and in shock is offered as evidence against the theory of local fluid loss being a primary factor in the development of shock due to muscle injury.

3. Tests for pyrogenic and antigenic activity of isinglass are outlined. The isinglass as now prepared has a relatively mild pyrogenic action. The temperature rise is well within the limit specified in the pyrogen test of the United States Department of Public Health. Isinglass is free from antigenic action.

4. No abnormalities have been observed in the livers and kidneys of animals which have received repeated injections of isinglass intravenously over a period of weeks.

5. The regeneration of plasma protein after depletion caused by acute hæmorrhage does not appear to be interfered with by the transfusion of isinglass solution. There is some evidence that the injected protein is utilized for building body tissue and possibly in the manufacture of plasma protein.

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RÉSUMÉ

La transfusion d'isinglass (collagène provenant de vessies natatoires de merluches) est physiologiquement possible. La valeur de ce produit est bien démontrée dans les cas d'hémorrhagies aiguës; par ailleurs, l'isinglass et le sang complet sont inefficaces dans le traitement du choc provoqué par les traumatismes musculaires. Il semble manifester que le choc dû aux traumatismes musculaires n'est pas causé par la déplétion sanguine. L'isinglass que l'on fabrique actuellement est à peu près dépourvu de toxicité, car on n'a pas observé de dégâts hépatiques ou rénaux chez les animaux soumis aux transfusions d'isinglass. Bien plus, l'isinglass ne retarde pas la régénération des albumines du plasma lorsqu'on l'injecte à la suite d'hémorrhagies aiguës.

JEAN SAUCIER

THE CLINICAL USE OF ISINGLASS*

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PURIFIED, powdered isinglass, prepared by Prof. N. B. Taylor as described elsewhere in this *Journal* (p. 251), has been administered to 61 patients at the Toronto General Hospital. In all instances the purified powder was dissolved in physiological saline solution and autoclaved to insure sterility. It was stored in the refrigerator until the time of intravenous infusion, the longest period of storage being 19 days. It was used in concentrations of 4, 6 or 7%.

A total of 58 administrations were given to 51 patients, chiefly for the purpose of detecting pyrogenic or other toxic effects; the remaining ten patients were given isinglass solution for the treatment of shock or hæmorrhage.

PYROGENIC OR OTHER TOXIC EFFECTS

The 51 patients selected for a study of pyrogenic or other toxic effects were, in nearly all cases, suffering from chronic diseases and had little or no fever. Most of them did not require intravenous therapy and the isinglass infusions were administered chiefly for the purpose of

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determining if any unfavourable reactions followed the injection. The dose given varied from 25 to 800 c.c. and averaged about 300 c.c.; the solution was infused by the gravity-drip method with the exception of the 25 c.c. doses which were given by syringe.

The rectal temperature, pulse and respiratory rate were noted at hourly intervals during and for a few hours after the infusion of isinglass solution, as well as on the following day; the blood pressure readings were also taken and any unfavourable symptoms were recorded. There was considered to be a febrile reaction when the rectal temperature rose to 100.3° F. or higher or, in cases with pre-existing fever when the temperature increased one degree Fahrenheit. In no instance did a severe or alarming reaction occur.

Of the 58 administrations of isinglass solution to 51 patients, a febrile reaction followed in eight instances. In no case was the fever sustained longer than a few hours and the maximum elevation of temperature to 103.8° F. per rectum, occurred in a patient who had a slight fever before the solution was given. In two of the eight cases in which a febrile reaction occurred, a definite chill marked the onset; the remaining cases complained of a chilly sensation; other associated symptoms in these cases were malaise, headache and nausea.

An improved preparation of isinglass has been used in the last twenty-four administrations of this group and also in the treatment of ten cases of shock. A febrile reaction followed in only three cases. One of these, a patient with carcinoma of the recto-sigmoid region, did not suffer symptoms or signs of a febrile reaction till eight hours after the termination of the infusion and it is possible that administration of the isinglass was not the cause. In one patient, known to be sensitive to fish, a mild urticaria appeared and lasted about an hour.

Intradermal skin tests with isinglass solution were done on two patients after having two and four infusions respectively; the tests were negative.

In the remaining 50 infusions of isinglass solution no unfavourable symptoms or signs followed.

THE TREATMENT OF SHOCK OR HÆMORRHAGE WITH ISINGLASS SOLUTION

Ten patients suffering from the effects of shock or severe circulatory collapse were treated

by the intravenous administration of isinglass solution. All patients responded favourably to the infusion; in no instance was there evidence that the isinglass had given rise to any toxic manifestations.

The dose of isinglass infused varied from 200 c.c. in the case of an infant, to a total of 8,800 c.c. during the course of three days to a patient suffering from severe burn shock.

Acute hæmorrhage.—Three patients were suffering primarily from the effects of acute hæmorrhage. Administration of 800 c.c. of 4% isinglass solution to each of the first two of these patients resulted in a slight increase in blood pressure. Blood transfusions were then given because the blood pressure had not as yet reached a satisfactory level. In the third case (Case 1) the blood pressure returned to the normal range after the administration of 800 c.c. of 6% solution of isinglass and shock did not recur.

Shock following extensive burns (3 cases).—An eighteen-months old infant was given 200 c.c. of 4% solution to relieve mild shock following a burn involving 30% of the body surface and made a satisfactory response. The other two cases were suffering from severe shock and hæmoconcentration following burns involving about 40 and 70% of the body surface respectively. The shock and hæmoconcentration were effectively treated by the infusion of 3,800 c.c. of 4% isinglass solution in the former case (Case 2) and by 8,800 c.c. of 6% isinglass during the course of three days in the latter case. It is interesting to note that, although the latter case died of toxæmia on the seventh day, the serum proteins were normal at the time of death (total serum proteins 6.7%; albumin 4.4% and globulin 2.4%). An autopsy was performed on this case by Dr. W. L. Robinson who reported that the internal organs showed remarkably few abnormalities; a few small patches of early broncho-pneumonia were found in the right lower lobe but there were no signs of petechial hæmorrhage in the gastrointestinal tract nor was there any transudation in the serous cavities.

Shock following compound fractures (2 cases).—Both of these patients were in a state of mild shock and both responded well to an infusion of 600 and 800 c.c. of a 6% solution of isinglass respectively.

Severe circulatory collapse (2 cases).—One of these patients had generalized peritonitis; in the

other the cause was not discovered. Both showed a slight temporary increase in blood pressure and improvement following the administration of 800 c.c. of the 4% solution. Both subsequently died.

Brief summaries of two representative cases follow:

CASE 1

Female, aged 44 (C.G. No. B38234). This patient accidentally plunged her forearm through a window pane and suffered a severe laceration and severance of the radial artery. She was admitted to hospital about two hours after the accident in a state of severe collapse as a result of profuse hæmorrhage; she was semi-conscious, very pale; the skin was cold and moist; the pulse rate was barely perceptible, 50 per minute and the systolic blood pressure 45 mm. of mercury.

The rapid intravenous administration of 500 c.c. of 5% glucose in physiological saline, resulted in slight improvement. This was immediately followed by the infusion of 800 c.c. of 6% isinglass over a period of twenty minutes, following which she was markedly improved; she was alert, the pulse rate was 60 per minute and the blood pressure 120/72; the hæmoglobin was 38%. An anæsthetic was given, the radial artery ligated and the wound sutured.

Although the patient's condition was satisfactory and the blood pressure was well maintained, a transfusion of 500 c.c. of blood was given five hours after the administration of isinglass because of the anæmia.

Subsequently the patient progressed well. Her temperature never rose above 100° F. Four days after the accident the hæmoglobin was 48% and the red blood count 2.8.

CASE 2

Female, aged 49 (L.S., No. B20689). Diagnosis: (1) thermal burn (40% of body surface); (2) manic depressive psychosis.

This patient was admitted to hospital in a state of moderately severe shock about four hours after the infliction of the burn; pulse rate 144, blood pressure 95/80, hæmoglobin 108% and hæmatocrit 47%. During the next hour she was given 250 c.c. of human plasma. At the end of that time her blood pressure was 85/70 and hæmoglobin 117%. No more plasma was given.

Administration of a 4% solution of isinglass was commenced two hours after admission and a total of 3,800 c.c. were infused during the next twenty-four hours. Her hæmoglobin fell to 80% and the blood pressure rose to 200/110. She then vomited about one pint of dark brown fluid and the blood pressure fell toward normal and subsequently was never found at a level higher than 165/90. No further infusions of isinglass were required as the hæmoglobin remained at levels below 80%.

The serum proteins, which were 7.8% on admission, fell to 4.8% (albumin 2.8%, globulin 2.0%) two days after admission. Subsequently the level slowly recovered and the total proteins were 7.3% twenty-two days after admission.

During the first few days the urine volume was low, its specific gravity varied up to 1.041, albumin, sugar and a trace of urobilin were found and occasional granular casts were seen. The blood non-protein nitrogen rose to 53 on the second day. Subsequently the blood non-protein nitrogen and urinalysis were normal except that a trace of albumin continued to be found in the urine for a time. On the second day the blood hæmoglobin was 84%; red cell count 4.3 million, white blood count 21,000, blood smear showed no significant change except for an increase of polymorphonuclear cells. Blood chlorides, CO₂ combining power and Van den Bergh were normal.

The burns on the torso were treated by 10% tannic acid spray and those on the extremities by application of 5% sulfathiazole emulsion. Although the patient survived the period of burn shock and toxæmia, she died six weeks later as a result of wound sepsis.

SUMMARY AND CONCLUSIONS

Purified, powdered isinglass, dissolved in physiological saline solution, in concentration of 4 to 7%, was administered intravenously to a total of 61 patients. It was given to 51 patients to detect the occurrence of pyrogenic or other toxic effects and to ten patients in the treatment of shock and acute hæmorrhage.

When properly prepared, isinglass solution appears to be a safe blood substitute. In a small proportion of cases a slight or moderately severe febrile reaction occurred. In none of the patients to whom it was administered for the treatment of shock did any type of unfavourable reaction, febrile or otherwise, occur.

In a small series of cases of shock, the intravenous administration of solutions of isinglass appeared to be of value.

PATHOGENETICAL CORRELATIONS BETWEEN PERIARTERITIS NODOSA, RENAL HYPERTENSION AND RHEUMATIC LESIONS*

By Hans Selye, M.D., Ph.D., D.Sc., F.R.S.C. and
E. Irene Pentz, M.Sc.

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THE purpose of this communication is to report upon experiments which revealed close pathogenetical relationships between periarteritis nodosa, nephrosclerosis, arterial hypertension and the rheumatic lesions.

In 1866 Kussmaul and Maier¹ discovered a disease which they described under the title "Concerning a Curious Hitherto Not Described Disease of the Arteries (Periarteritis Nodosa) Which is Accompanied by Bright's Disease and Rapidly Progressing Muscular Paralysis". We recently found that under certain experimental conditions a hormone of the adrenal cortex can elicit arteritis nodosa in animals and that the outstanding accompaniments of this artificially induced disease are the same as those to which, 77 years ago, Kussmaul and Maier gave prominence by special mention in the title of their

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article on the spontaneously recurring malady of man.

Concerning the literature on arteritis nodosa, the reader is referred to the excellent summary of Motley,² in which 215 cases have been reviewed. Here we only wish to discuss those communications which throw some light upon the pathogenesis of the disease and its relationship to nephrosclerosis, hypertension, and certain rheumatic manifestations.

PATHOGENESIS

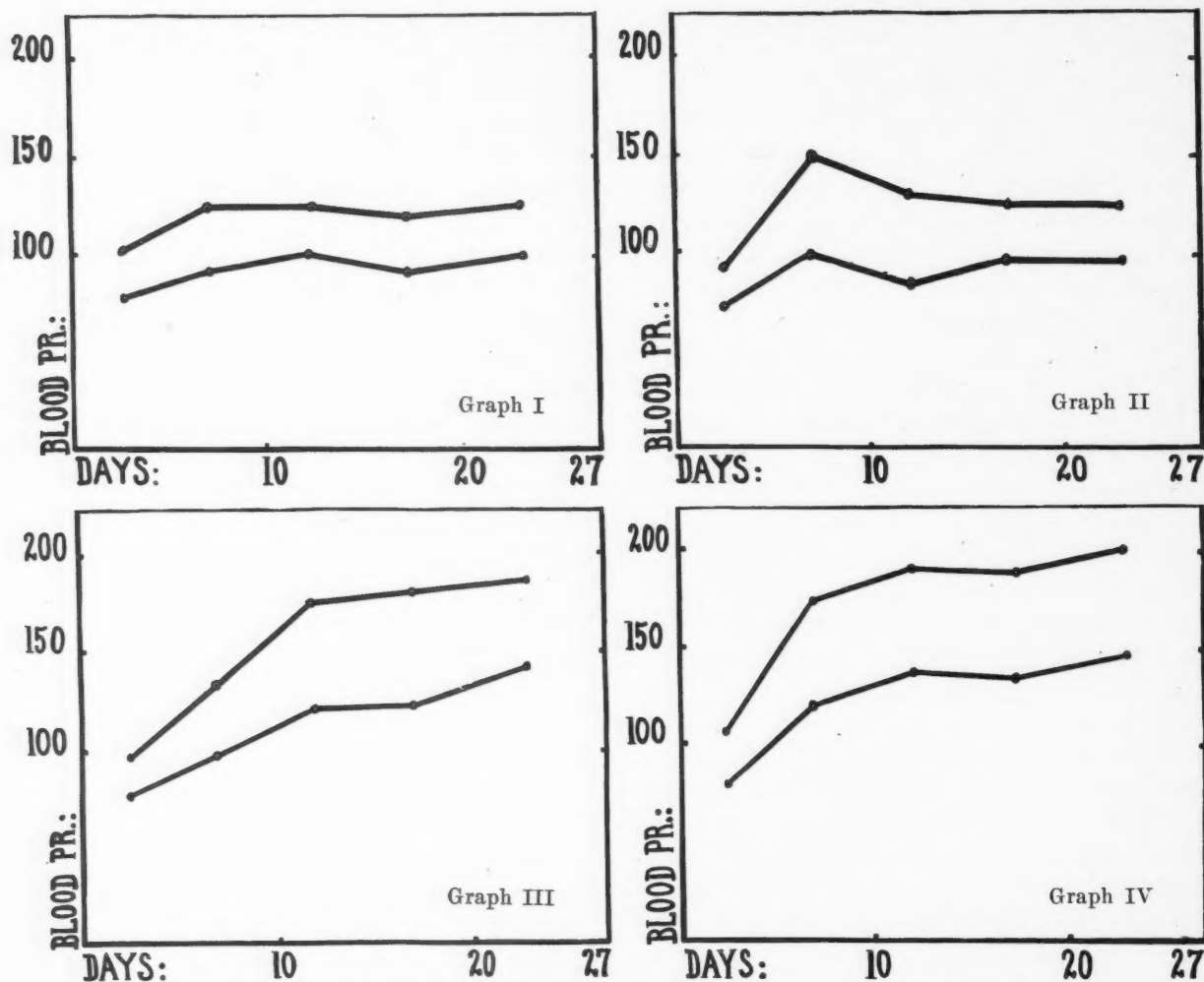
The fact that periarteritis nodosa is very frequently accompanied by obvious signs of nephrosclerosis and hypertension, is evident, even from the most cursory study of the published cases.^{3, 4, 5} It has also been emphasized that, conversely, the arterial lesions in the kidneys of patients suffering from malignant hypertension are histologically similar to arteritis nodosa. Haining and Kimball⁶ pointed out in their review on periarteritis nodosa that "when the kidney is chiefly involved, the course is indistinguishable from essential hypertension with nephrosclerosis". They also emphasized, in agreement with many other workers, that the mesenteric arteries are most commonly affected.

The relationship with rheumatic fever is less clear. The histological appearance of the arteritic nodules is somewhat reminiscent of rheumatic foci, and the fact that both these lesions are often found along the course of blood vessels in the heart and in the subcutaneous tissue may be interpreted as tentative evidence of such a relationship. The comparatively frequent association of rheumatic fever with manifestation of periarteritis nodosa is much more striking. Klinge⁷ stated that "... there also is a 'rheumatism' of the arteries and veins which in its final stage gives the impression of arteritis nodosa. . . ." Friedberg and Gross⁸ reported four cases of periarteritis nodosa associated with rheumatic fever and rheumatic heart disease; the latter being confirmed by the presence of Aschoff bodies in the myocardium. They collected many similar additional cases from the literature. More recently, Spiegel⁹ described fifteen cases of periarteritis nodosa with autopsy reports. Four of these had had manifest rheumatic fever.

Experimental work also suggests that intimate relationships exist between periarteritis nodosa, renal hypertension and rheumatic-allergic manifestations. Klinge¹⁰ succeeded in producing a

condition similar to rheumatic arthritis by repeated injections of horse serum in the rabbit. He emphasized that there was an accompanying arterial lesion which "resembled most closely that seen in the arteritis nodosa of man and animals". v. Haun¹¹ transmitted the disease from a proved case to guinea pigs by blood transfusion; hence, he believed the condition to be infectious. Harris¹² injected a mush of arteritis nodule tissue into rabbits, and these subsequently also developed the disease. Since passage through a Berkefeld N filter did not inactivate tissue extracts, he concluded that the condition is infectious and is caused by a virus. As no controls were done with mush of normal tissues, the significance of this experiment is rather doubtful, since several other investigators produced either typical periarteritis nodosa or malignant nephrosclerosis by treatment with various proteins. Thus Metz¹³ elicited periarteritis nodosa by streptococcus injections, but found that following sensitization, cattle serum produces the same effect. He also emphasized that some of his animals which received serum treatment exhibited histological changes of the rheumatic type and called attention to the frequent association of rheumatic and allergic conditions in man. By feeding a high protein diet to unilaterally nephrectomized rats, Blatherwick *et al.*¹⁴ produced nephrosclerosis, with obliteration of the capsular space, dilation of the convoluted tubules and formation of hyaline casts. Similar changes have been elicited in the intact dog, cat, rabbit and guinea pig by repeated injections of horse serum or egg white.¹⁵ More recently, Oberling¹⁶ obtained comparable results by multiple intravenous serum injections in the rabbit and mouse. It is not within the scope of this communication to discuss the voluminous literature on the so-called "nephrotoxic" sera which are generally considered to be highly specific.¹⁷

Although, perhaps not quite relevant to our problem, we wish to point out, furthermore, that Meeker *et al.*¹⁸ produced experimental atherosclerosis in rabbits by feeding high protein diets containing defatted casein. This diet was also active in aggravating the atheromatous lesions caused by cholesterol feeding. In conclusion, it may be mentioned that the self-observations of Bienstock,^{19, 20} led him to conclude that human hypertension is also a form of "protein toxicosis".



Graphs I to IV.—Average blood pressure curves of the animals in the four groups of the experiment described in the text. The upper line represents the systolic and the lower the diastolic pressure.

LEGENDS FOR ILLUSTRATIONS

Fig. 1.—Macroscopic view of a normal intestinal loop (Group I). Note thin and regular mesenteric vessels.

Fig. 2.—Macroscopic view of an intestinal loop showing periarteritis nodosa (Group IV). Note numerous bead-like nodules along the mesenteric vessels.

Fig. 3.—Section through mesenteric insertion on intestinal wall (Group IV). Low magnification. Note thickening and infiltration of the transversely sectioned mesenteric artery.

Fig. 4.—Transverse section through mesenteric artery showing first stages of periarteritis nodosa (Group IV). Medium magnification. Note deposition of a thin layer of hyaline material underneath the somewhat irregular endothelial surface.

Fig. 5.—Transverse section through mesenteric artery showing a somewhat more advanced stage of periarteritis nodosa (Group IV). Note almost complete destruction of the endothelium with deposition of a fairly thick layer of hyalinized fibrin-like material on the vascular wall. The structure of the vessel is almost unrecognizable owing to heavy infiltration with leucocytes, many of which are eosinophilic. Some giant cells are also detectable. (Same magnification as Fig. 4).

Fig. 6.—Transverse section through mesenteric artery showing final stage of periarteritis nodosa (Group IV). Thick layer of hyalinized fibrin lines the lumen, the vessel walls underwent partial necrosis and, hence, appear somewhat homogeneous (same magnification as Fig. 4).

Fig. 7.—Arteritic nodule at the bifurcation of a mesenteric artery. Note thick layer of fibrin lining the vessel walls and a U-shaped thrombus which almost com-

pletely occludes the lumen (Group IV). The thrombus consists, mainly, of fibrin, platelets and leucocytes (same magnification as Fig. 4).

Fig. 8.—Degeneration of myocardial fibres with replacement by somewhat oedematous connective tissue (Group IV).

Fig. 9.—Typical Aschoff body in myocardium (Group IV).

Fig. 10.—Typical Aschoff body in subendocardial layer on a papillary muscle (Group IV). Note the characteristic eccentric location in the course of a blood vessel (in upper left corner of nodule). Centre of nodule consists of hyalinized material. Several Aschoff cells are detectable.

Fig. 11.—High magnification of a small Aschoff body in myocardium showing several slightly basophilic polymorphonuclear Aschoff cells with characteristic fringing cell borders (Group IV).

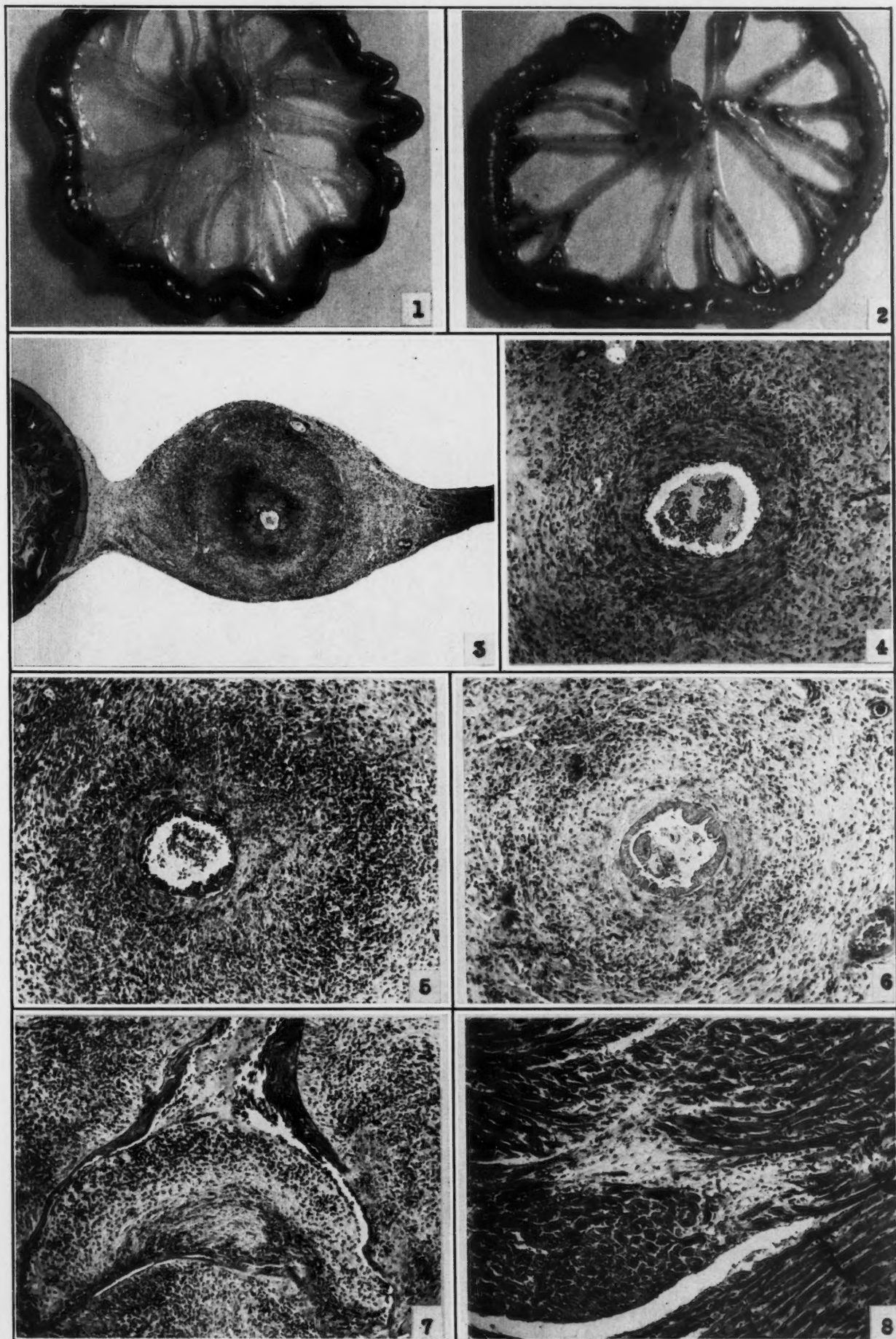
Fig. 12.—Pancreas with acute oedema of the stroma (Group IV).

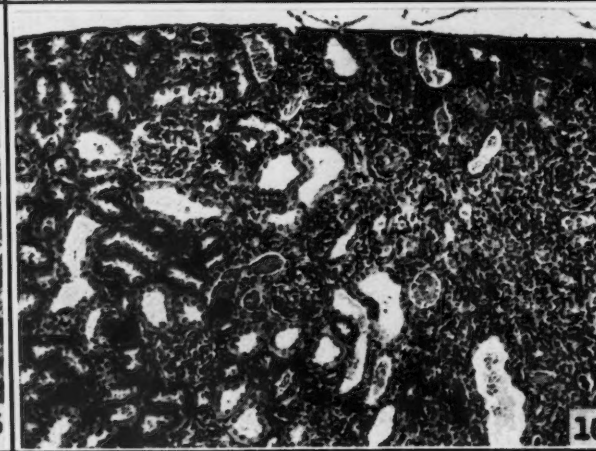
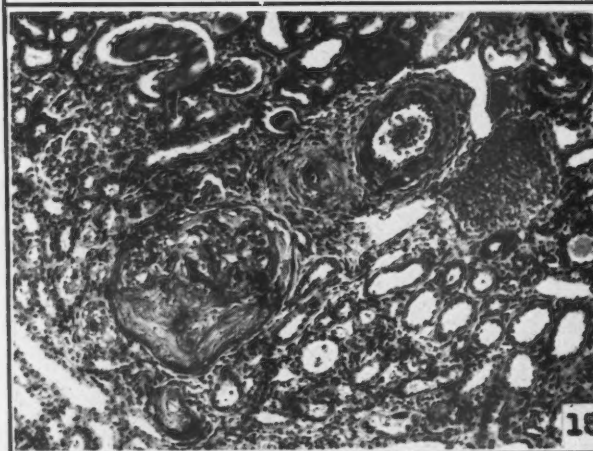
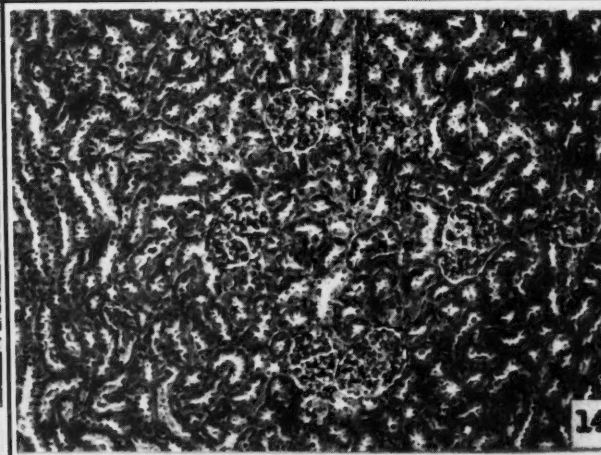
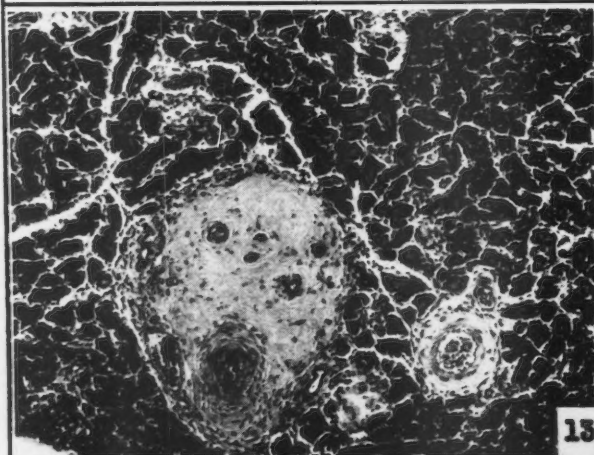
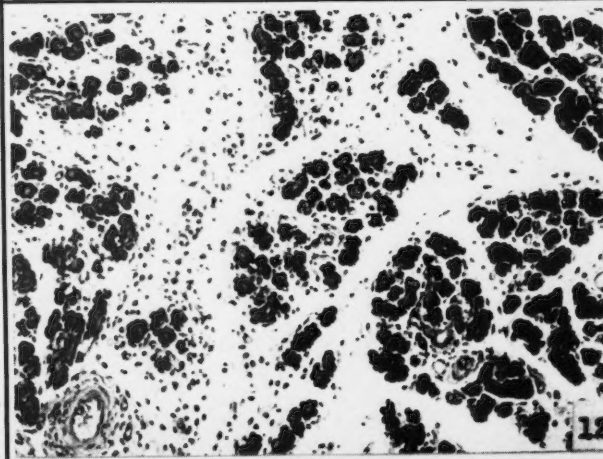
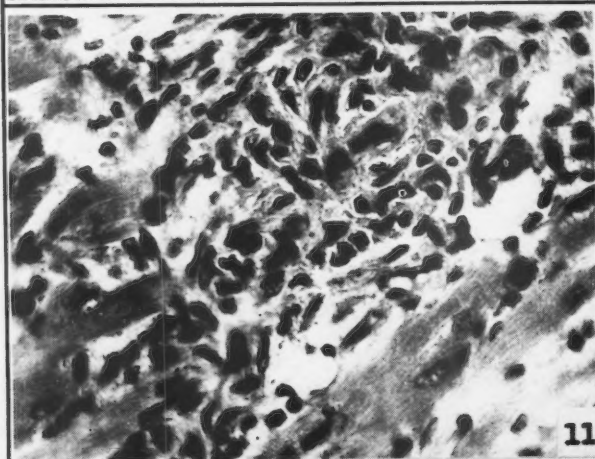
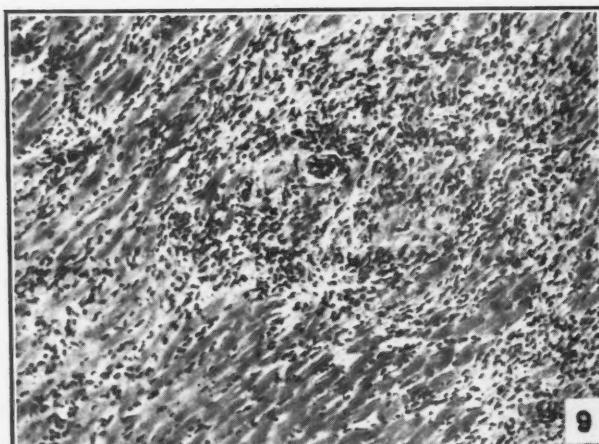
Fig. 13.—Pancreas with marked hyalinization of the perivascular connective tissue (Group IV).

Fig. 14.—Control kidney (Group II). Note normal renal structure.

Fig. 15.—Nephrosclerotic kidney (Group IV) showing sclerosis of medium sized artery, greatly enlarged glomerulus with transudation of hyaline material into the capsular space and dilated convoluted tubules, many of which contain hyaline casts.

Fig. 16.—Subcapsular region of the kidney (Group IV) taken from the borderline of a sclerosed infarct area (right) and comparatively normal renal tissue (left).





Experiments performed in our laboratory during the last few years made it quite clear that certain steroid hormones exert a specific renotropic action^{21, 22} and that depending upon the chemical structure of the steroids, they may produce tubular hypertrophy and hyperplasia with improvement in kidney function and no sign of hypertension (true renotropic action) or nephrosclerosis with hypertension (nephrosclerotic action).^{23 to 26} The most active representatives of compounds exhibiting a true renotropic action are some of the androstane derivatives, while, among all steroids examined up to the present time, desoxycorticosterone acetate (D.C.A.) proved most potent in producing nephrosclerosis. Even extrarenal blood vessels are frequently damaged by D.C.A., and, among these, the medium-sized pancreatic arteries are especially severely affected.²⁷ Animals receiving large amounts of NaCl in their drinking water are markedly sensitized to these toxic actions of the corticoid hormone.^{25, 26, 27} In animals with a highly developed central nervous system, such as the dog, and especially the monkey, acute administration of NaCl following chronic treatment with D.C.A. elicits certain motor disturbances characterized by tremor, choreiform twitches and convulsions, which are eventually followed by more or less widespread paralysis.²⁶

Our present experiments show that the apparently so widely different manifestations of nephrosclerosis, hypertension, arteritis nodosa, the rheumatoid type of connective tissue nodule and certain choreiform nervous disturbances are actually closely related to each other, since they can be experimentally produced by a single agent, namely D.C.A.

EXPERIMENTAL

This experimental series was originally designed to increase the sensitivity of our present test method for nephrosclerotic activity. It was felt that ablation of one kidney might increase the D.C.A. sensitivity of the remaining renal tissue. The synergistic effect of NaCl and the greater sensitivity of females, in comparison with males, may now be regarded as definitely proved; hence, we felt that salt-treated partially nephrectomized female animals might be the ideal test object.

Four groups, each consisting of eight female albino rats, having an average weight of 98 grm. (range 80 to 133 grm.) were used. All four

groups received a 1% NaCl solution instead of drinking water, and were fed "Purina Fox Chow" throughout the experiment. The rats of Group I were not otherwise treated and acted as controls. In Group II the left kidney was removed at the beginning of the experiment, but no other treatment was given. Group III was treated in the same way as Group I and Group IV as Group II, but in addition the animals of Groups III and IV were also given 3 mgm. of an aqueous crystal suspension of D.C.A. (concentration 30 mgm. per c.c.) subcutaneously twice daily. Three animals in Group III and two in Group IV died of pneumonia during the course of the experiment. The remainder was killed on the 27th day. The blood pressures of all animals were followed (using the technique of Friedman³⁰) at approximately weekly intervals. The average values are summarized in Graphs I to IV. From these, it is evident that salt treatment in itself leaves both the systolic (upper line) and the diastolic (lower line) blood pressure essentially normal (Graph I). Unilateral nephrectomy causes a slight transitory rise which may be due to the compression ischaemia of the kidney which probably occurs during the first period of compensatory hypertrophy until the capsule stretches proportionally with the enlarged renal volume (Graph II). Combined treatment with NaCl and D.C.A. on the other hand, elicits a rise in both the systolic and the diastolic blood pressure. This rise continues throughout the experimental period and is accompanied by a gradual increase in the difference between the systolic and diastolic blood pressure, as shown by the progressive divergence of the two lines in Graphs III and IV. These changes are elicited by the hormone both in the intact (Graph III) and in the unilaterally nephrectomized (Graph IV) animals, but are more conspicuous in the latter.

MACROSCOPICAL FINDINGS

At autopsy, the most striking change was the presence of many reddish nodules along the mesenteric blood vessels. These were most numerous in the vascular territories of the small and upper large intestine, but were also detectable in the vessels of the rectum and stomach. Such nodules were present in all animals of Group IV, but only in one rat of Group III; hence, it appears that this action of D.C.A. is promoted by unilateral nephrectomy. In Groups I and II, the nodules were absent. From the

cases in which the lesions were comparatively slight, it was obvious that the blood vessel bifurcations are first affected. In more advanced cases, however, nodules were found at short intervals throughout the entire length of the vascular tree (Figs. 1 and 2).

The pancreas showed varying degrees of oedema in most D.C.A. treated animals, and this, again, was more pronounced in Group IV than in Group III.

Perusal of Table I indicates that the kidney was greatly enlarged in the D.C.A. treated groups. The weight of the remaining single

hormone will be considered in greater detail in a future publication. The bile duct of the rats in Group IV was somewhat thickened and dilated. At least in one case it contained concretions.

MICROSCOPICAL FINDINGS

Upon histological examination, the nodules seen along the course of the mesenteric vessels prove to be due to an enormous thickening of the vascular walls. The structural changes are strikingly similar to those seen in human cases of periarteritis nodosa. The earliest stages are characterized by the appearance of a thin layer of hyaline, eosinophilic material just underneath the endothelial lining, and during this stage the muscularis and adventitia are slightly thickened due to oedema and some connective tissue proliferation. During the subsequent development of the change, the subendothelial hyaline layer increases in height, and in many places, the endothelial lining is cast off. Almost the entire muscularis becomes necrotic or hyalinized and is heavily infiltrated by leucocytes, many of which are eosinophilic. Erythrocytes also appear in the connective tissue spaces of the muscularis and occasionally there are phagocytes containing a greenish-brown pigment, apparently derived from the hæmoglobin of decomposing red blood corpuscles. Large cells, often polynuclear—which bear a striking resemblance to the Aschoff cells of rheumatic nodules—are usually also quite prominent within this layer. Their cytoplasm is more tingible than that of the other mesenchymal elements and they have an indistinct fringed border. The adventitia shows similar, but less pronounced changes and usually remains oedematous even in the late stages. In the most advanced cases, the lumen of the blood vessel is completely, or almost completely, obliterated by the hyaline deposits on the vascular wall and by thrombi which consist mainly of fibrin and leucocytes. In these instances the changes resemble those characteristic of thrombangiitis obliterans. From this stage, the process may apparently proceed in one of two directions. In some cases the inflammatory lesions progress to heavy infiltration of the vessel walls with formation of pus and small abscess-like foci. In other cases the lesion heals by the formation of dense scar tissue with usually a rather hyaline matrix. Similar vascular lesions have also been observed with great frequency in the pancreas and the

TABLE I.

ORGAN WEIGHT CHANGES FOLLOWING UNILATERAL NEPHRECTOMY AND D.C.A. TREATMENT

Groups	Treatment	Kidney weight*	Heart weight	Liver weight
I	Control	1.36 grm. (1.20-1.48)	0.63 grm. (0.55-0.70)	7.52 grm. (6.04-8.30)
II	Unilaterally nephrectomized	0.96 grm. (0.80-1.28)	0.64 grm. (0.57-0.78)	6.18 grm. (4.31-7.72)
III	D.C.A.	2.13 grm. (2.09-2.19)	0.87 grm. (0.71-1.04)	7.91 grm. (6.36-8.77)
IV	D.C.A. Unilaterally nephrectomized	1.60 grm. (1.04-2.20)	0.94 grm. (0.77-1.15)	10.52 grm. (8.82-12.60)

*The figures listed in this column represent the combined weight of both kidneys in the case of intact animals (Groups I and III) and that of the one remaining kidney in the unilaterally nephrectomized rats (Groups II and IV).

kidney in unilaterally nephrectomized animals is, of course, above normal in any case, due to compensatory hypertrophy; however, this enlargement is especially marked following D.C.A. treatment, and the average weight of a single kidney in Group IV is greater than that of both kidneys in the control Group I. It is also noteworthy that in both D.C.A. treated groups, but especially in Group IV, the surface of the kidneys was very irregular and mottled. The larger spots were light, the smaller ones red, as in the "flea bitten" kidney of focal embolic glomerular nephritis. The heart was also enlarged in both D.C.A. treated groups and especially so in Group IV. The hearts of this group revealed small white spots reminiscent of minute anæmic infarcts.

The liver weight was not significantly increased in the D.C.A. treated intact animals of Group III, but was considerably above normal in Group IV. This hepatotropic action of the

kidney. The medium-sized muscular arteries are most severely affected, but especially in the mesentery, the kidney and pancreas the small arterioles and even the veins may reveal lesions of a similar type (Figs. 3 to 7).

The heart shows changes typical of rheumatic myocarditis and endocarditis. Throughout the myocardium there are small foci, the centre of which often consists of necrotic or hyaline material and around it large epithelioid cells with bulky vesicular nuclei and a more or less basophilic cytoplasm. Many of these cells contain several nuclei and are apparently identical with the Aschoff cells of rheumatic fever. In these nodules there also is some fibroblast proliferation and infiltration with lymphocytes, plasma cells and polymorphonuclear leucocytes. The nodules are evidently the experimental counterpart of Aschoff bodies (Figs. 9 and 11). In contrast to these obviously proliferative nodules, we note, in other parts of the myocardium, replacement of degenerating muscle fibres by ordinary, sometimes oedematous, connective tissue (Fig. 8). These non-specific foci are apparently identical with those seen by Darrow and Miller.²⁸

In some of our animals, we also noted lesions resembling rheumatic endocarditis. As in the early stages of the spontaneous disease, the subendothelial layer is more severely affected than the endothelium itself. The lesion is also clearly proliferative. The nodules are very vascular and densely infiltrated by lymphocytes. There is marked proliferation of fibroblasts and Aschoff cells. In our animals the endocardium covering the papillary muscles was markedly affected (Fig. 10).

The histological changes in the pancreas result from similar vascular lesions. In the acute stages there is a great deal of oedema, while in more advanced cases, not only the blood vessels, but extensive portions of the connective tissue framework are transformed into hyalinized scar-like tissue (Figs. 12 and 13). Many of the Langerhans islets are likewise involved in this process of hyalinization, as are some of the pancreatic nerves. The latter are occasionally surrounded or infiltrated by leucocytes, thus exhibiting the picture of a neuritis.

The kidney shows a rather malignant nephrosclerosis as described in our previous publications. There is an enlargement, and often hyalinization, of the renal corpuscles, transudation of hyaline material into the capsular space and dilatation of the convoluted tubules many

of which contain hyaline casts. The blood vessels, especially the medium sized arteries and arterioles, show the histological picture as described above for the mesenteric vessels. The structural similarity with the lesions of the mesenteric periarteritis nodosa and of the changes in the renal vessels in typical malignant nephrosclerosis are worthy of special emphasis. Some of the renal vessels are partially or completely thrombosed. This may be responsible for the occasional appearance of wedge-shaped infarct-like areas of dense sclerosis (Figs. 14, 15 and 16).

DISCUSSION

These investigations demonstrate the possibility of producing, with a corticoid hormone, nephrosclerosis with hypertension, as well as lesions similar to those seen in periarteritis nodosa, thromboangiitis obliterans and the rheumatic fever of human pathology. This makes it very probable that the above-mentioned diseases are closely related to each other. It is well known that exposure to sudden stress (toxic drugs, cold, acute infections, etc.) elicits an "alarm reaction" and if the damaging stimulus continues to act, this is followed by the resistant stage and eventually by the exhaustion stage of the so-called "general adaptation syndrome".²⁹ During this adaptation syndrome the adrenal cortex increases in size and produces excessive amounts of corticoid hormones. The symptoms and signs of the adaptation syndrome, and more particularly the response of the adrenal cortex, are comparatively independent of the specific nature of the eliciting agent and determined primarily by the intensity of the damage. One of the most prominent features of the syndrome is a break-down of body proteins. Conversely, exogenous administration of protein is pre-eminently capable of eliciting the syndrome and particularly the adrenal cortical stimulation. It is also known that corticoids increase general resistance and facilitate adaptation to diverse damaging agents.²⁹

These facts suggest, in conjunction with the observations described in this communication, that an increase of corticoid production, though advantageous for resistance to stress may elicit manifold pathological manifestations of corticoid hormone overdose. The fact that such overdose phenomena may be produced by endogenous corticoids is rendered highly

probable by other experiments as well. It has been found that exposure to cold, or other damaging agents causes rats, sensitized by salt treatment, unilateral nephrectomy, or preferably both, to develop pathological changes identical with those produced by D.C.A. administration (Selye, unpublished). Our interpretation of the above-mentioned facts may explain why acute infectious diseases (tonsillitis, scarlet fever, streptococcus infections) nervous shock, exposure to cold and other types of severe strain, so frequently precede the appearance of rheumatic fever, periarteritis nodosa and malignant nephrosclerosis. Hence, we believe that all these conditions are closely related to each other and should be regarded as diseases of adaptation. They are not the direct result of the apparent eliciting agent but are, at least partly, caused by an abnormal adaptive response of the adrenal cortex. We wish to emphasize, however, that this interpretation does not attempt to minimize the rôle played by microorganisms in the pathogenesis of these adaptative diseases. Infection may act, firstly, as a stimulator of adrenal activity, and, secondly, lesions produced by corticoids (e.g., in the endocardium) may be sites of predilection for the localization of microbes. Thus, streptococcus viridans is certainly of great importance in subacute bacterial endocarditis, another disease frequently associated with a history of rheumatic fever.

Further experiments will have to show what circumstances determine whether the same agent will produce one or the other of the above-mentioned manifestations.

SUMMARY

Experiments in the rat indicate that the toxic effect of chronic desoxycorticosterone acetate overdosage are considerably increased by unilateral nephrectomy.

Severe overdosage with this corticoid reproduces in the rat morphological lesions similar to those seen in periarteritis nodosa, malignant hypertension and rheumatic fever.

It has been emphasized that in the human the development of these diseases is usually preceded by infections, exposure to cold or other damaging agents, and that in animals similar changes appear in the course of adaptation to cold and other noxious stimuli. Concurrently, during adaptation the adrenal cortex is increased in size and produces excessive amounts of corti-

coids. Hence, we believe that the above-mentioned diseases are, at least partly, caused by an abnormal (probably excessive) adaptive response of the adrenal cortex and represent diseases of adaptation.

The expenses of these investigations were defrayed through the Frank W. Horner Fund. The authors are also indebted to Dr. Erwin Schwenk of the Schering Corporation of Bloomfield, N.J., for the D.C.A. used in these experiments.

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A statement on the keeping qualities of canned foods has been made by the Ministry of Food after consultation with the Ministry of Health, the periods during which the various foods may be stored applying to conditions obtaining in the ordinary home. Sweetened, full-cream condensed milk is best used within six to nine months, after which it tends to become sugary; whereas unsweetened condensed milk will keep for as long as three years. Canned fish and such meat packs as sausage meat, meat rolls, and galantines, tongues, and soup keep the best of all canned foods, and their "shelf life" extends to some five years. Honey and jams keep for at least three years if contained in lacquered tin plate cans, but if the ends of the cans are lacquered steel one year is the normal maximum life for jams. Vegetables in lacquered cans keep well for at least to years, but beans in tomato sauce will keep even longer. One year only may be regarded as the full "shelf life" for soft stone fruits, and they should be kept in a cool place.—*J. Roy. Inst. of Pub. Health & Hyg.*, 1943, 6: 190.

THE POSSIBLE TRANSFER OF TROPICAL DISEASE DUE TO WAR CONDITIONS*

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A CONSIDERATION of the disease problems likely to be encountered in North America following the return of troops from tropical and sub-tropical countries requires a prior consideration of the geographical distribution of disease.

The tropics and sub-tropics, from the medical point of view, are not easily defined. The best compromise consists in accepting as the tropics, those equatorial lands comprised within the 68° F. isotherm, *i.e.*, lands in which the average monthly temperature of the coldest month is never under 68° F. The sub-tropics are the adjacent lands where the average monthly temperature for the whole year is never under 68° F. The boundary between these areas is not a line, although we draw it as such on the map; it is not even a fixed band, and we cannot separate the tropics from the sub-tropics and the sub-tropics from the temperate lands, any more than we can draw a perfect map of the world.

Nor can we define tropical diseases with complete accuracy. I know of no better description of these, however, than that written by Sir Patrick Manson many years ago, in the introduction of his famous textbook:

"The title which I have elected to give this work, Tropical Diseases, is more convenient than accurate. If by tropical diseases is meant diseases peculiar to the tropics, then half-a-dozen pages might have sufficed for their descriptions; for at most, only two or three comparatively unimportant diseases strictly deserve that title. If on the other hand, the expression tropical diseases be held to include all diseases occurring in the tropics, then the work would require to cover almost the entire range of medicine; for the diseases of temperate climates are also, and in almost every instance, to be found in tropical climates. I employ the term tropical in a meteorological rather than in a geographical sense, meaning by it sustained high atmospheric temperature; and by the term tropical diseases, I wish to indicate diseases occurring only, or which from one circumstance or another, are specially prevalent, in warm climates."

For our purpose, we need only consider diseases of an infectious nature, diseases caused by actual organisms (including the so-called ultra-visible viruses). All living organisms demand

certain physical conditions for their well-being, certain temperatures, certain media, certain opportunities. Actually there is only one important strictly tropical disease—African sleeping sickness—and so we will follow Manson's wider definition.

Manson further pointed out the importance of the shifting of geographical distribution of disease and anticipated that modern travel would further increase this dispersion. At the same time he believed that the fact that many tropical diseases depended on animal causes or animal vectors, would delay this. Bacterial germs are more likely to be found everywhere: the animal germs and vectors are much more exacting in their requirements outside of man. However, even the animals can be transplanted. Many diseases came west with the negroes—hookworm, intestinal blood-flukes, the filaria worm and so on—and settled permanently in the New World. Others, like the chigger-flea, made the reverse trip. Others, like the guinea-worm, came, but found only a temporary lodging. The wooden ships with their crude hygiene and slow passage sometimes acted as floating islands and carried the yellow fever mosquito and yellow fever, plague, cholera, typhus, relapsing fever and so on. If the ship landed in a suitable environment the disease took root and settled down; if not, there was a sudden epidemic which faded away with unsuitable weather. Steel ships reduced this danger, but the aeroplane re-introduced it by eliminating distance and by circumventing man-made barriers. After the last war, it brought rabies into Britain. A few years ago, it carried *Anopheles gambiae*, a most notorious carrier of malaria, from Africa to Brazil. Steps have been taken to reduce these risks but they are not yet perfect and the dangers are very real. As Melleney recently pointed out, the retractable undercarriage offers a haven for winged insects, a haven which is automatically emptied before the plane lands and which must therefore be disinfected by mechanical devices while the machine is in flight.

There is another method of transmission, man himself. Never have so many men from temperate climates been simultaneously within the tropical regions, often under conditions which make it impossible to apply the civilian rules for prevention of infection. Most of these men will come back and many will bring infections with them. And there is a final method by

* Read before the State Medical Society of Vermont, Burlington, May 14, 1943.

which these organisms may come back, within animals returning with the troops as pets.

GEOGRAPHICAL DIVISIONS OF DISEASE

We may divide our important infectious diseases into four main geographical categories: (a) Diseases limited to cool climates; (b) diseases of universal distribution; (c) diseases of potential universal distribution, but now limited in temperate climates by sanitation, not by geography; (d) diseases limited to warm climates.

We are concerned here with (c) and (d), and we in North America are liable to meet with both groups during and after the war. The first group will occur in troops but need not spread to civilians unless our sanitary barriers break down; the second group cannot spread.

The members of the first group of importance are: (1) Contagious diseases such as small-pox, rabies, leprosy; (2) excremental diseases such as cholera and the dysenteries, and such conditions as hydatid cyst, which are carried in faeces; (3) food-carried diseases such as Malta fever; (4) arthropod-carried diseases such as benign tertian and quartan malaria, typhus and related organisms, relapsing fever and plague.

The second group includes such conditions as malignant tertian malaria, trypanosomiasis, leishmaniasis, yellow and dengue fevers, numerous worms such as blood flukes, lung flukes, hookworms, filaria worms, guinea worms, and so on; various ecto-parasites and such spirochaetal conditions as yaws.

THE MALARIAS

There are several fundamental facts about malaria which, while known by everyone, are not properly realized. The most important is that the word "malaria" *per se* has no more significance than "intermittent fever". There are at least four species of human malarial parasites distinct as to morphology, bionomics, pathology and epidemiology. It is most important to qualify the malaria of which we speak because some forms are of little importance, whereas others are of the utmost importance.

Ovale malaria is a rare, apparently African, form of only academic interest at present.

Quartan malaria is a widespread but generally uncommon disease; it is common in some temperate localities but is usually absent or rare from the highly malarious spots in the tropics. It is quite often confined to children or drug

addicts and is of little military importance. It is characterized by a 72-hour cycle in the parasite.

The most widespread of the malarias is benign tertian, benign only in comparison with the remaining form and in that it seldom by itself causes death. Its geographical distribution is from 63° N. to 35° S. In cool countries such as Holland there is usually a spring outbreak followed by a second rise in the fall; the spring cases are mostly autumn infections, the fall cases, relapses. Farther south, *e.g.* south of 40° N. (*e.g.* Italy) it is more continuous. It is present in America, although its modern distribution is now considerably more limited than a century ago when its limit appeared to be the summer isotherm of 60° F. Then it stretched into Canada and earlier settlers complained of what was obviously this malaria among the Indians in the Niagara belt and among the colonial troops in Upper Canada, or Ontario. Dr. C. R. Twinn, in a recent address, drew attention to an outbreak among workmen on the Rideau Canal (between Ottawa and Lake Ontario) a century ago. The mosquito carriers are still present; in places they are even abundant, yet endemic malaria has disappeared not only from Canada but from the New England States, West Virginia, the Dakotas, Utah, Wyoming, Montana and Nevada. It is present still in the other States, mainly east of the 30" mean annual precipitation line and especially in the lower Mississippi Valley and the south-eastern coast where between three-quarters and one million persons are affected.

The final form of malaria has been given a number of different names, all emphasizing one or another of its various characteristics; malignant malaria, because it is the killing form of the disease; sub-tertian, because it does not have the sharp, well-defined paroxysm of benign tertian and tends to become a remittent or even continuous fever instead of an intermittent one; tropical, because it is quite definitely a disease of warm lands; and *æstivo-autumnal*, because in the sub-tropics and adjacent warm temperate lands (as far north as 40° N. in Europe), it requires the warmth of summer for its development in the mosquito, and human infections show in the late summer or fall; in the tropics proper it has no seasonal distribution, but is found throughout the year. Its temperature limits are the mean summer isotherm of 70° F. and mean winter, of 48° F. The development

in the mosquito is arrested below 60° F. (probably below 70° F.) and at a humidity of under 63%. It occurs in Salonica and the Danube marshes in Europe and has gone as far north as Moscow on occasion. In the United States it is present only on the fringe of the Gulf States, south of Chesapeake Bay and the Ohio Valley. It is widespread throughout those regions where our armies are now or have recently been operating both in Asia and Africa. The oases of north Africa produce a very virulent malignant malaria which tends to assume atypical forms, the most virulent occurring most frequently during the winter season from bites of hibernating mosquitoes; this form most often resembles typhoid fever. Often, however, a malarial subject, while in the mild climate of the tropics may keep in fair health, but when transferred to the north, the rigors of winter, cold and fatigue, may cause the latent malaria to break out. We shall certainly meet this most important of all the malarias from now until some years after the war, in soldiers in all parts of North America. Every medical man must be on the look-out for it, and must be able to diagnose it quickly and accurately because speed is the essence of successful treatment.

The classical clinical picture of an intermittent fever with its paroxysms of "cold, hot, sweat" and its intermittent "good" day, is characteristic of benign tertian but only sometimes of malignant malaria. Here there are more often "dumb" chills, and the fever tends to be continuous, or remittent ("bilious" remittent and "typhoid" remittent forms are recognized). There is often a double peak in the fever, the temperature rising in steps; there is usually no "good" day between paroxysms, and for a portion of the cycle, just before the fever starts, the parasites are absent from the peripheral blood.

Malignant malaria is as great an imitator of other conditions as is syphilis or trichinosis, and the only sure diagnosis is the demonstration of the parasite in a blood smear. It should be a routine question in the future made to every patient by every doctor: "Have you been abroad and if so, where?" If he has been, look for malaria. Cases have already been misdiagnosed because of the absence of this simple question, and mistakes are costly.

The Services are taking every possible precaution to prevent any of the malarias in our fighting troops. Complete prevention under

active service conditions is impossible, although we may expect less malarial disease than if the war had taken place twenty years ago, thanks to the League of Nations to a considerable extent. All kinds of attacks are being made on the parasite and its vector, including what is called "prophylactic or suppressive therapeutics". This consists in the administration of atabrin or quinine to all troops in a malarious district. In most cases, this prevents the development of malarial symptoms and enables the troops to continue fighting, but it does not prevent the parasites from gaining admission to the body. If the drug is stopped, clinical malaria will usually develop and so it is necessary to continue the suppressive treatment for some time after possible exposure. There is of course, no vaccine for any of the malarias.

We shall certainly meet with malaria in our returned troops after the war: whether there will be an increase of the diseases in our civilian populations is another matter. The conditions for the malarias to become endemic are: (1) There must be suitable anophelines present. (2) They must bite man. (3) Man's blood must contain the sexual stages of the parasite in proper numbers (at least twelve per c.mm.), in proper proportions and of proper age. (4) The temperature must be suitable for the development of the parasite in the mosquito. (The optimum temperature for benign tertian is 77° F. when it takes 11 days to develop; for malignant it is 9 to 10° F. higher. There is no development under 60° F. but the parasites will survive in mosquitoes for some time at lower temperatures and during hibernation). (5) The humidity must be suitable. (6) Both mosquitoes and infected men must be above a certain minimum number.

The return of men from the tropics to England after the last war caused a slight increase in indigenous malaria but it was by no means serious. An analogous increase may be expected in North America after this war, especially in the south, although it is doubtful if there will be any appreciable amount in the north. The diversion of men from the country to the factories may lead to an increase in anopheline (and other) mosquitoes, which would of course, increase the chances of outbreaks.

I believe that there is a minor risk of benign tertian malaria becoming temporarily endemic in some parts of North America now free from the disease, and a possibility of an increased

endemicity of both benign tertian and æstivo-autumnal malaria in the south. Consequently, it would be well to suspect the presence of the malarias in civilians who have not been abroad and make the appropriate enquiries.

There are two virus diseases of warm lands carried by mosquitoes which must receive our consideration—yellow fever and dengue. Both are usually carried by *Aedes ægypti* but both may be carried by other mosquitoes and it is well to remember that many of our local mosquitoes belong to the genus *Aedes*.

YELLOW FEVER

Yellow fever is endemic over vast areas of South America, in the Amazon Valley, and in Africa from the West Coast to the upper reaches of the Nile, areas across which our aeroplanes are continually flying. From these areas, infected mosquitoes or infected men can be transferred quickly to North America. They have been so transported by the wooden ships of the past. *Aedes ægypti* is a true domestic animal. It can only survive in close association with man and it breeds in artificial water containers in and near houses and on board ships. In that way, the wooden ships carried the disease far and wide on both sides of the Atlantic, although, curiously, never into the Pacific. In 1710 they brought an epidemic to Quebec. It has been present as far north as Maine, but its last official appearance was in New Orleans in 1905. It can appear anywhere where the temperature is over 65° F., the lower limit for development of the virus in the mosquito; the optimum temperature is 80° F. The virus can live in the mosquito at temperatures between 40 and 60° F., although the bite is not then infective. Although once infected the mosquito is infective for life, there is no inherited transmission and man is immune for life after an attack, becoming so about a week after the development of symptoms. Artificial immunity is now well established and all troops visiting potential yellow fever areas are vaccinated.

Aedes ægypti is established in the southern States and can become temporarily established farther north (as it did some years ago in England, when it was found breeding in a hollow tree in Epping Forest). So long as the mosquito is present, there is risk of an outbreak; the aeroplane has certainly increased that risk and will continue to make continual precautions necessary at aerodromes.

DENGUE FEVER

Dengue fever has a much wider distribution than yellow fever. For example, it is widespread in the countries on the Indian and Pacific Oceans, from which yellow fever has always been absent. In most respects, however, the factors governing its distribution are similar; it is carried by the same mosquito, the patient is infective to the mosquito for a day or so before symptoms and for three days thereafter; in the mosquito, the virus has an incubation period of 11 to 14 days and the insect remains infective for life thereafter; there is no hereditary infection of *Aedes*; the incubation period in man is four to nine days. However, immunity is short and virulence is low. At least two species of *Aedes* are carriers and more may be. It is endemic in southern Texas and outbreaks have occurred in other States quite recently (e.g. Florida, 1934). The risks of meeting dengue are greater than those of meeting yellow fever, but are not great north of Philadelphia (where it has occurred in the past). It is unlikely to be seen in its active state in Service men because of its short course, but its long convalescence may be noted. The disease is apt to be confounded with yellow fever, scarlatina, measles, syphilitic roseola, influenza, meningitis, typhus, hæmorrhagic smallpox, enteric and malaria.

We need not consider in great detail the other insect-carried diseases. Leishmaniasis will be encountered in the returning troops, especially cutaneous leishmaniasis from North Africa and kala azar from Burma. There is little possibility of it becoming indigenous, although species of *Phlebotomus*, the genus to which the carrier fly belongs, have been recorded from the southern States. The same is true of African trypanosomiasis. The parasite is limited by the tsetse and cannot settle here, although it is possible for the tsetse itself to be carried to tropical South America and become an American species; its viviparous habits and the Amazon forests would assist this. American trypanosomiasis is already present in animals at least in the southern States and there is no reason why it should not already have occurred in man.

TYPHUS FEVER

Typhus in its various forms will be seen. Several forms are already indigenous all over North America but unless there is a breakdown

in American health standards and lousiness increases there is little danger. However, it is well to remember that the head-louse as well as the body-louse can be a carrier. The same considerations as to endemicity and spread of spirochaetes of relapsing fever, apply. Both diseases are present in North Africa and are prevalent among the Arabs. Both will probably come back and will require to be diagnosed, but neither should spread. This is particularly so because of the great advances in anti-louse measures recently developed in the Services. However, it is well to remember that both diseases are closely associated with famine and malnutrition and careful watch should be kept over persons from impoverished countries.

PLAGUE

Plague is probably not a problem in this war, at least not yet, but it is well to remember that it exists, that sylvatic plague is present in North America and that the very important vector, the tropical rat flea, is now widely distributed throughout the United States and southern Canada. However, plague is not a tropical disease and avoids the strict tropics; its optimum temperature is 50 to 80° F., with a reasonable degree of humidity. Vaccination against plague is still experimental and the situation requires continuous vigilance by our public health authorities.

THE DYSENTERIES

No group of diseases has caused more trouble to armies than the dysenteries. Of these, the most important are the bacterial dysenteries caused by *Shigella*. These diseases are not tropical but depend for their distribution on sanitation. They are carried mainly by flies, to a lesser extent by water (in which the organisms can survive three weeks), more rarely by contact. Dysentery is most prevalent where flies are most common and so it is frequent in warm lands. In the last war, it was very common in the Mediterranean area and is regarded as the main reason for the Allied failure to take Turkey. Then the very toxic Shiga strain comprised about 60% of the cases. In the present war the picture is different and more hopeful. Hamilton Fairley and Boyd of the A.A.M.C. have recently reported on 8,665 cases of dysentery examined in North Africa in 1941:

12.3%	were due to	amœbæ
4.5%	" " "	mannitol-fermenters
3.6%	" " "	non-mannitol fermenters
52.3%	" " "	Flexner-Boyd group of dysentery organisms (mostly Flexner II and VI)
15.8%	" " "	Shiga
6.3%	" " "	Sonne
5.2%	" " "	Schmitz

The reduction in numbers is probably due to fewer flies, while the reduction in severity is due to good general health, good food, and absence of intercurrent disease.

Bacillary dysentery has never given rise to pandemics outside of the army, while epidemics have most frequently been recorded from Japan and the Far East. It is still giving considerable trouble in the south and south-west Pacific. The main factor in its control is hygiene rather than climate, and the milder cases, because they are not hospitalized, are more likely to disseminate the disease than the serious ones. Carriers are the most dangerous.

The carrier problem is different from that in typhoid. That disease is primarily a septicæmia with secondary localization in the intestine. Dysentery is localized in the intestine and mesenteric glands. The organisms are scarce and the carriers are not well known; apparently they may be convalescent carriers (usually) or "healthy" (rare). The convalescent carrier state rarely lasts more than four to six months but may persist for a year (or in a few cases three years). About 3% become carriers, especially of Flexner; the Shiga carrier is an invalid. There is no vaccination against bacillary dysentery. Men will come back from the army as carriers and, should they return to country districts where sanitation is poor and where the water supply may be contaminated from the septic tank, there is real danger. That danger has always existed of course, but again the removal of men from the country and the introduction of more cases may well increase the risk.

Of the large number of protozoa which inhabit the human intestine, only one is pathogenic and that only in a minority of cases. This is *Endamæba histolytica*. It, like the dysentery bacilli, has a cosmopolitan distribution but is more common in the tropics than here. It is spread by flies and water, as well as by food and actual contact. The cases of actual amœbic dysentery cannot usually spread the infection; the carrier does, and, unless treated correctly, a large proportion of the dysentery cases become carriers. Otherwise the factors controlling the spread of bacillary dysentery are similar to those

controlling the spread of amœbiasis with one exception. Chlorine does not necessarily destroy the amœbic cysts in water (unless it is used in about double the usual concentration) and so the risks of infection are greater. There will in all probability be an increase in the incidence of intestinal protozoa after the war, although not necessarily of amœbic dysentery. Rural sanitation must be kept at a high standard to keep down flies, to protect wells, and to dispose of sewage in an efficient manner.

MISCELLANEOUS INFECTIONS

Cholera is endemic in lower Bengal and in China and its epidemics follow the routes of human intercourse, being conveyed by man, particularly on pilgrimages. It is mainly water-borne. The bacillus does not multiply below 60° F. or over 107° F.; its optimum temperature is 85 to 95° F. The "Broad Street pump" London outbreak was due to an infected well. It appeared in Toronto in 1834 and 1849. Up to a fifth of recovered patients may carry the organism and excrete it for some time; however, 90% become free in a fortnight and 99% in a month. Healthy carriers who have been contacts only, may excrete it for two months.

It has to be differentiated from "ptomaine" poisoning, bacillary dysentery, arsenical poisoning. Vaccination has greatly reduced the risk of infection, although immunity is neither complete nor permanent. However, it is not likely to be an important American problem after the war.

Small-pox and its benign variant, *alastrim* in the West Indies and South Africa, are common throughout tropical countries but vaccination has greatly reduced the risk of their introduction in personnel. The virus may be introduced apart from man, however, and care must be taken by public health authorities that this does not happen. *Rabies* is more common in the tropics and sub-tropics merely because dogs are under less control there — although wild carnivores and bats are sometimes involved. It is very prevalent in India (in wolves and jackals) and in North Africa. It was introduced into England by air at the end of the last war and care must be taken that sentiment does not outweigh common sense in this respect. Attempts to introduce carnivores from countries where the disease exists, except after a six months' quarantine, must be severely repressed. It is true that rabies exists in the United States

today, but there is no reason why it should be increased unnecessarily.

We may confidently expect infections with all three species of bilharzia worms, two African and one Far Eastern. All three have similar life-cycles, involving the usual trematode development in a snail; infection is by penetration of the skin during bathing and other immersion in water. Our forces are or will be, on active service, in countries where one or other species is present. *Schistosoma hæmatobium* occurs along the Mediterranean littoral, the Nile Valley and extensive areas in Central Africa; this species causes the well known vesicular disease. *S. mansoni* tends to occur on the western part of Africa as well as lower Egypt and has spread to some of the West Indian Islands and parts of South America; this species causes the intestinal disease. In Japan and parts of China occurs *S. japonicum*, which also causes an intestinal disease.

These parasites cannot become indigenous in North America because of the absence of a suitable vector. This is true of the various other trematode infections which might be picked up abroad through vegetables, fish or crustaceans.

Of the various cestode infections, there is a possibility of encountering cases of *cysticercosis* due to *Tænia solium*. Lieut.-General McArthur, of the Royal Army Medical Service in Britain, has put on record a considerable number of cases contracted in India by British soldiers. The infection can be a serious one, as the larval tapeworm often becomes located in the central nervous system. Equally serious is the hydatid cyst, the larval stage of a dog tapeworm, common in north Africa, parts of Australia and other countries in which our troops are operating. Human infection is by ingestion of the egg as a faecal contamination and this often comes from contact of the hands with the dried faeces on a dog's coat. Knowing the soldiers' fondness for pets, particularly stray dogs, which are very often infected in north Africa, for example, it seems very probable that infections will be found after the war. The disease takes years before it manifests itself, sometimes as many as 20 years. The cyst develops to the size of a football and may form a series of secondary cysts; in 70% of the cases these are in the liver, in 25% in the lungs and in the remaining 5% anywhere in the body. Any cystic condition seen in the liver or lung of a return-

ing soldier during the next decade should arouse the suspicion of an amœbic abscess or a hydatid cyst, and the appropriate diagnostic tests should be employed.

Infections with *Filaria bancrofti* will almost certainly be seen because of the extremely wide distribution of this mosquito-carried worm in warm lands. Most frequently, however, they will be either symptomless or nearly so. It must often have been introduced into the warmer parts of the United States because it is very common in the West Indies, but it has only been recorded as being settled in South Carolina. The reason for this is not known; the mosquito vector is widespread and returning troops might supply a sufficiently large reservoir of infection to extend the infection to other areas in the south. It cannot extend in the north.

Hookworms are not a military risk, and it is unlikely that many will be contracted by the troops. In any case, *Necator* is already widespread in the southern States. Infections with *Ancylostoma* might be contracted in the Mediterranean region and brought home to extend the hookworm zone a little farther north. The risk, however, is very slight.

Guinea worms are distributed from Africa to India and are carried by "water fleas". These are swallowed in well water and so there is a possibility of infections in our troops. This parasite was often introduced in the past into tropical America but has never become a problem. It is very unlikely that it will become one now.

GENERAL REMARKS

The general result of this survey is encouraging. While it is more than probable that many tropical conditions will be seen in our returning soldiers, it is unlikely that any of these diseases will become indigenous North American infections. There may be temporary local endemic areas of some set up, but the maintenance of normal standards of public health and personal hygiene will prevent serious outbreaks. The speed of modern travel will assist the introduction of exotic conditions but this will be to some extent neutralized by modern chemotherapy and the application of the sanitary sciences to aeroplane travel. There is a greater risk in the introduction of pets—especially carnivores and rodents—and this will be encouraged by the civilian population. It should

be a fundamental principle of military hygiene to prevent the adoption of pets abroad by the Services. They can carry too many diseases to man, diseases which are often not familiar. In addition to those commonly found, there may be new ones freshly introduced. Very few human diseases are exclusively human; of these the malarias, dysenteries and cholera are the most obvious examples. Consequently, the introduction of pets acquired abroad by troops must receive the most serious consideration of health authorities, and the authorities must not be swayed by sentiment.

Every medical man must be prepared to diagnose tropical disease in his ex-soldier patients and he must be especially on the lookout for the more chronic conditions. A knowledge of where his patient has been will be invaluable assistance. Tropical travel will probably be extended greatly after the war, so that it is unlikely that this knowledge will be required only temporarily, even although these diseases are unlikely to be acquired locally.

RÉSUMÉ

Les bateaux, les avions, les hommes et les animaux peuvent transporter chez nous les maladies tropicales, et à cause de la diffusion possible de ces maladies pendant et après la guerre il faut bien les connaître. Parmi les malaras, maladies transmises par des moustiques, il importe d'être familier avec la fièvre tierce bénigne qui est très répandue et peut à l'occasion s'observer dans nos climats. La malaria maligne est nettement une maladie tropicale et ressemble à la typhoïde; elle peut évoluer pendant l'hiver chez un sujet infecté au cours d'un séjour aux tropiques. La maladie est très protéiforme et le seul test diagnostique certain est la présence du parasite dans le sang étalé sur lame. On peut s'attendre à une recrudescence temporaire de la malaria en Amérique après la guerre. La fièvre jaune et la dengue sont deux autres maladies inoculée par des moustiques. La première, évitable par la vaccination est actuellement transmissible par les avions, vecteurs de moustiques; la seconde, plus répandue mais moins grave est soumise aux mêmes modes de transmission. Le typhus et la fièvre récurrente sont peu à craindre car la prophylaxie de la pédiculose est déjà appliquée sur une vaste échelle. La peste ne constituera probablement pas un problème de cette guerre. La dysenterie bacillaire sera surveillée surtout par l'examen attentif des porteurs de germes. Il n'existe pas de vaccination contre cette maladie. La dysenterie amibienne sera évitée également par la surveillance des porteurs de kystes amibiens. La vaccination protège assez bien contre le choléra; il en est de même pour la variole. La rage peut être transportée par les carnivores non soumis à une stricte quarantaine. La bilharziose, la cysticercose et la filariose peuvent difficilement élire domicile en Amérique du Nord. Quoiqu'il en soit, il importe que les médecins soient parfaitement au courant de ces maladies afin de les reconnaître, puis d'en empêcher la dissémination.

JEAN SAUCIER

INFECTIVITY OF FLUORESCENT HAIRS IN SCALP RINGWORM*

By D. E. H. Cleveland, M.D.

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SCALP ringworm in children has been treated with apparent success for nearly forty years by various means, such as epilation by x-rays, or thallium acetate, or topical medication with fungicidal chemicals. Apart from the risk to the patient in unskilled hands attending the use of x-rays or thallium acetate, the epilation with the former is seldom absolutely complete. Fungicidal chemicals, while quite efficacious in the case of *M. lanosum* infections, are less often so in *M. audouini* infections, and seldom are of use in treating infections by the less common fungi. Until about 1925 the only test of cure and non-contagiousness was the clinical one. Unless one should examine microscopically, if not culturally as well, every hair on the clinically negative treated scalp, there was no other means of assurance that the child was no longer a possible source of contagion.

In 1926 it was demonstrated¹ that hairs infected with fungus fluoresced characteristically in the rays from an ultra-violet generator passed through a filter of Wood glass. This was corroborated by other investigators,^{2,3} and it was found that a child's head with close-clipped hair could be placed in the path of such rays in a darkened room, when at once every infected hair became brilliantly visible against a dark background. The test was closely similar to, but more reliable than, the identification of spirochaetes with the dark-field microscope. This method of examination was not only of the utmost value in investigating suspected cases of ringworm, determining the extent of infection in the scalp, and gauging the progress under treatment, but also to decide when a case could be pronounced cured.

Since 1927 every private patient whom I have treated for scalp ringworm has been submitted to the Wood light test as a criterion of cure and non-contagiousness. Since about 1932 the same test has been applied to every case passing under my control at the Skin Clinic of the Vancouver General Hospital. No child has been pronounced "cured" and permitted to return

to school until found "Wood-light negative". During the years that have elapsed since the introduction of this method several hundred scalp ringworm cases have passed through my hands. As time passed I have been struck with increasing force by the observation that a large proportion of cases which have presented no clinical signs whatever, have been found nevertheless to be "Wood-light positive". These clinically negative cases have included children who had been in close contact with clinically recognizable cases, and children who had been treated by roentgen epilation or other methods and pronounced "cured".

Parenthetically, I wish to reiterate the opinion which I expressed in 1936⁴ that all scalp ringworm on the Canadian Pacific Coast is due to *M. lanosum*, and is readily amenable to treatment by topical applications of fungicidal remedies. I have been able to cure all cases seen since 1933 without resort to x-ray epilation or other methods. The observations made in 1936 were based upon clinical grounds and the therapeutic test, but in over a hundred cultural investigations made since then no other fungus but *M. lanosum* has been found.

Thousands of cases of scalp ringworm everywhere are treated by radiologists and other non-dermatologists. It is safe to say that most of these therapists are unaware of the existence of the Wood filter and its significance. It is also regrettable to observe that by no means all dermatologists use the Wood light. This can only mean that many thousands of children in the past, and at present, have been and are and will continue to be released annually into circulation among other children in homes and at school, clinically negative but "Wood-light positive".

From consideration of these facts the suspicion has developed that "Wood-light positive" hair may be non-infective; that hairs in which living fungus no longer exists may still retain their fluorescent properties. It may have been too readily assumed that "Wood-light positive" cases were contagious.

From a family of six children all having scalp ringworm four became clinically and "Wood-light negative" in a few weeks. Two others were for some reason refractory to treatment. All had been subjected to the same simple method of shampooing with tincture of green soap daily, and inunctions of the entire scalp with ammoniated mercury in vaseline morning

* From the Section of Dermatology, Department of Medicine, G. Lyall Hodgins, M.D., Physician-in-Chief, Vancouver General Hospital.

and night. Subjected to ordinary naked eye examination under ordinary lighting conditions, all six scalps presented the same appearance. They would have been pronounced clinically cured by any competent observer. But two when examined under the Wood filter showed one or two loose aggregations of fluorescent hairs on each scalp, as well as occasional widely scattered hairs occurring in small tufts of three or four or singly. These hairs examined under the microscope showed the usual spore mosaic, and also a number of mycelial filaments—a less common finding in fresh material—and further, they showed some bodies which appeared identical with the fuseaux seen in culture mounts. No growth on culture could be obtained from these hairs. It was suspected that the mercury which had been used up to the day previous to taking the specimens for culture may have been present in sufficient concentration to inhibit growth on media. The use of all remedies except the tincture of green soap was discontinued for a week, and then more fluorescent hairs were taken and inoculated on Sabouraud's medium. From these normal growths resulted. Other fluorescent hairs removed at the same time were rubbed on the lightly scarified skin at the base of the ear of a month-old kitten, previously examined and found "Wood-light negative". The kitten was kept in isolation and examined every few days. At the end of two weeks a dime-sized patch of fluorescent hairs appeared suddenly at the site of inoculation. At the same time the skin of the site was observed to be slightly rough and "scurfy".

It would thus appear that a child who has been pronounced cured by the ordinary diagnostic criteria may still harbour living fungus which will escape recognition unless its entire scalp has been subjected to careful examination under the Wood light. It does not seem unreasonable to assume that such a child will be infectious to other children.

It is considered that this small piece of investigation is complementary to that of Davidson and his co-workers⁵ who found that kittens that had been in contact with children having scalp ringworm had fluorescent hairs about their heads, although having no other symptoms, and were regarded as carriers.

It is therefore submitted that children who have had scalp ringworm should not be pronounced as cured and released into circulation until they have been examined and found to be

"Wood-light negative". Children who have been exposed by more or less intimate contact with cases of ringworm, whether of the scalp or glabrous skin, should not be pronounced uninfected until examination of the scalp after a period, arbitrarily suggested as three weeks, has elapsed and they are found to be "Wood-light negative". It is to be added as a note of interest that the two "recalcitrant" cases made complete recovery and became "Wood-light negative" about six weeks after the experiment was started, during which time they had no other treatment except daily shampoos with tincture of green soap and warm water. This is an instance of the tendency to spontaneous recovery in scalp ringworm due to *M. lanosum* noted by Lewis and Miller.⁶

Why do not clinically negative but "Wood-light positive" cases again become the subjects of clinically typical ringworm when they are discharged erroneously as cured? Why do such cases when released not become at once the nuclei of new epidemics in schools and other institutions?—or do they? If these sequelæ do not take place—and it has not been demonstrated that they do—what immunity-mechanisms operate to prevent them? These are interesting questions that justify further investigation.

CONCLUSIONS

Children who have been treated for scalp ringworm, or who have been closely exposed to patients with ringworm of scalp or glabrous skin, although clinically negative, may often be found to have many hairs fluorescing characteristically under Wood light.

Hairs which fluoresce characteristically under Wood light are infected with living fungus.

The fungus in such hairs will produce typical growths on suitable laboratory media, and produce clinically typical infections when inoculated upon susceptible animals.

Children who are clinically negative but Wood-light positive are potential sources of infection for others.

Children with scalp ringworm should not be pronounced cured, in the light of our present knowledge, until examined and found Wood-light negative.

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BRIGHT'S DISEASE—A CLINICAL AND PATHOLOGICAL STUDY*

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BRIGHT'S disease is still listed in the United States Registry as fourth in the causes of death. Any disease that leads to such a high death rate must be considered of major importance. Viewed in its broader aspects, the importance of Bright's disease increases when one considers that so many of its forms lead not only to incapacity and suffering, but so often its victims become a burden to themselves and a long and constant care to those upon whom they depend.

We have thought that it would be both interesting and instructive to analyze a series of consecutive cases of Bright's disease that have occurred in the Montreal General Hospital, upon which post-mortem examinations have been performed. The period selected covered the eight years from 1931 to 1938 inclusive. This period was selected for several reasons. One was that throughout it the newer methods of examination, especially laboratory procedures, had become a well established routine, and with the aid of them it has been possible to make a more exact diagnosis and prognosis. Another reason, to us perhaps a more important one, is that we had seen most of the cases either in the Out-patient Department or in the wards and many of them had been under our own care.

Only those cases that had been in the wards long enough to have been thoroughly studied or had for some time attended the renal clinic in the Out-patient Department were selected. Each case had been followed from a few weeks to several years.

Histological sections of the various organs from each case were reviewed. Special attention was given to the kidneys. Besides the routine stains, some of the kidney sections were

stained with differential stains, such as fat, elastic tissue, azo-carmin and reticulum stains.

Before the work was undertaken, strict criteria were laid down as to what histological findings justified the diagnosis of each of the types of Bright's disease under study. The criteria are those that are generally accepted by both clinicians and pathologists. As a result, the microscopical findings required before a final differential diagnosis was made were such, that no doubt was left as to the diagnosis. Pyelonephritis and amyloid disease were excluded and there were no cases of true nephrosis.

The hospital population of the Montreal General Hospital consists almost entirely of adults. This accounts for the scarcity of cases of acute interstitial nephritis and the absence of acute glomerulonephritis. It will be seen that there are more males than females. This is due to the fact that there are twice the number of beds for males.

The 99 cases under review fall into four groups:

		Cases
Group 1—Acute interstitial nephritis.....	6	
“ 2—Subacute glomerulonephritis	11	
“ 3—Chronic glomerulonephritis	12	
“ 4—Arteriolar nephrosclerosis	70	

We propose to analyze the cases in each of these groups and add some general remarks upon the four groups of Bright's disease they represent.

ACUTE INTERSTITIAL NEPHRITIS

Six cases comprise this small group, four of them had positive blood cultures. In three of these *S. hæmolyticus* was recovered and, *Pneumococcus* Type II from the other. Of the remaining two, one had a peritonsillar abscess and died following an operation, from hæmorrhage and broncho-pneumonia. The remaining case was an elderly male who was clinically considered to be suffering from glomerulonephritis, complicated by uræmia and broncho-pneumonia. The age-period of this group ranged from 11 to 68 years. Four were males and two females. The duration of the illness varied from four days to six weeks, a relatively short period. The blood pressure was not increased, the fundi showed no changes, and œdema was absent. They all showed marked albuminuria, and numerous red blood cells, pus cells, and many casts in the urinary sediment. Leucocytosis was present in five cases. Four showed definite nitrogen retention. At post-mortem the heart weights were

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not increased and the kidneys were only a little heavier than normal.

It is of interest that none of these cases were diagnosed clinically, since the signs and symptoms associated with bacteraemia, especially in four of the cases, dominated the picture. The diagnosis of acute interstitial nephritis was made at post-mortem. Microscopically, the kidneys showed irregularly distributed focal areas of dense infiltration with lymphocytes and plasma cells. These were closely packed between the tubules, in and around the glomeruli.

SUBACUTE GLOMERULONEPHRITIS

Of the 11 cases comprising this group, 9 were males and 2 females. Eight were 45 years old or less. The ages varied from 17 to 56, the average being 38.5 years.

In only three cases were there recorded any previous infections that might have a bearing upon the kidney lesions. One was known to have had osteomyelitis for the past ten years. One, aged 45, had scarlet fever at 18 years of age, and one, aged 37, had an undiagnosed fever when 12 years old. Signs and symptoms had been present from one month to seven years, the average being 2.7 years. The blood pressure was elevated in all but one case. The systolic pressure varied from 132 to 254 mm. Hg. averaging 178. The diastolic pressure varied from 70 to 128, averaging 101. The fundi of ten had been examined. Four were normal, two showed some slight vessel changes only; two showed hæmorrhages and "white spots", and two showed papillædema, hæmorrhages and "white spots"; the findings in hypertensive neuro-retinitis. Œdema was present in all and was a prominent feature in 9 of the 11 cases. There was marked albuminuria, abundant red cells, white blood cells and casts in the urine of all the patients. The red blood cell count was below four million in all cases. It was three million or less in 6, and below two million in 2 patients. The average was 2.92 million. The hæmoglobin was below 71% in all but one case, and below 50% in 5 cases. It averaged 54.8%. The blood urea nitrogen was elevated in 100%. It varied from 32 to 239 mgm., the average being 130 mgm. %. The creatinine varied from p.4 to 11.8 mgm. %, the average being 5.8 mgm. %.

The weight of the heart which was increased in 9 of the 11 cases, varied from 290 to 680 gm., and averaged 486 gm. Pericarditis was

present in 5 cases. The kidneys were heavier than normal in all but one case. The combined weight of the two kidneys was above 400 gm. in 7 cases (64%) averaging 463 gm. Epithelial crescents in the glomeruli were present in all cases. The glomeruli also showed slight hyaline changes in 75%. Tubular atrophy was present in 5 cases. The arterioles were, for the most part, normal. The pathological diagnosis of subacute or second stage glomerulonephritis was made in all the cases. Of the 11 patients, 8 died in uræmia, 2 died from cardiac failure and 1 from lobar pneumonia.

CHRONIC GLOMERULONEPHRITIS

This group consists of 12 cases, 11 males and 1 female. The age varied from 17 to 65, averaging 44 years. Nine (75%) were between the ages of 32 and 52 years. Three cases gave a history of acute nephritis in childhood; one following scarlet fever, one following acute upper respiratory tract infection, and the other following erysipelas. The onset of the disease and duration of symptoms were extremely variable. Three patients who were admitted in uræmia complained of symptoms for only six months. In the remaining nine (75%) they were present from two to five years, averaging 3½ years. Hypertension was an outstanding finding in all the cases. The systolic pressure varied from 106 to 240 mm. Hg., averaging 184, while the diastolic varied from 40 to 160, averaging 103. Œdema was absent in 6 cases (50%), slight in 4, and marked in 2. Albuminuria was a constant manifestation. It was graded as a trace five times and a large trace, seven times. Hæmaturia was reported eight times (66%), and pyuria and casts were found eleven times (92%). Anæmia was a pronounced symptom in all cases and was extremely severe in two. The highest red blood count was 3,990,000 and the lowest was 1,900,000. In two patients the hæmoglobin was below 40%. In a general way the severity of the anæmia tended to parallel the impairment of renal function.

The blood urea nitrogen was elevated in every case. When admitted to hospital 9 patients (75%) showed an initial blood urea nitrogen over 100 mgm. %. In all but one case the initial finding was above 70 mgm. %. Later determinations in all cases showed a progressive rise. The highest reading was 192 mgm. %. The average terminal reading was 160 mgm. %. The blood creatinine paralleled the blood urea

nitrogen. It was present from 2.8 mgm. % to 10.7 mgm. %, averaging 6.5 mgm. %. The ocular fundi were reported upon in 9 cases by the ophthalmologists. In only one instance were the findings normal. Of the remaining 8 cases, hypertensive neuro-retinitis was recorded in 4 (50%), arteriosclerotic retinitis in 3 (37.5%), and arteriosclerotic changes only in 1 (12.5%).

At autopsy the weight of the heart was increased in all but 3 cases. This ranged from 390 to 620 gm., and averaged 468 gm. In the one female, the heart weight was normal—350 gm. The kidneys were below normal size and weight in 9 cases (75%). The smallest combined weight was 110 gm. In 3 cases the combined weight was above 300 gm. The average for the group was 227 gm.

Microscopically, rigid criteria were adhered to in the identification of this group. Only those cases showing characteristic glomerular, tubular, and interstitial changes were included. Epithelial crescents and hyaline glomerular changes were noted in all cases. Arteriolar lesions were recorded in varying extent in most instances. Uremia was the cause of death in 10 cases (83%). One patient died from an intercurrent infection, and the other died with generalized anasarca and convulsions.

ARTERIOLAR NEPHROSCLEROSIS

This group is made up of 70 cases; 42 males and 28 females. Their ages ranged between 19 and 74 years, the average being 50.04 years. While it is recognized that there are many clinical signs and symptoms that are common to all persons who have the arteriolar nephrosclerotic type of Bright's disease, the great majority of them fall into groups in which one or more organs seem to be especially damaged, or at least the predominating signs and symptoms are especially concerned with them, such as the heart, the central nervous system, and the kidneys. Because the cause or causes of death, like the clinical signs and symptoms, are not the same in all cases, we thought that it would be of interest to divide the 70 cases under consideration into groups, based upon the cause of death.

	Cases	%
Sub-group A—Those who died in uræmia..	23	32.86
“ B—Those who died a cardiac death	15	21.42
“ C—Those who died from lesions of the central nervous system	22	31.42
“ D—Those who died from some intercurrent condition	10	14.29

Sub-group A—Those who died in uræmia.—

This group consists of 23 cases, 14 males and 9 females: 18 of them were between the ages of 40 and 60; 13 were in the fourth decade. The average age for the whole group was 45.2 years. Signs and symptoms had been present for from 3 weeks to 5 years, the average being 1.5 years. All the patients showed hypertension. This was known to have been present for from 6 months to 10 years, with an average of 3.70 years. In 60% the blood pressure was over 200 mm. Hg. systolic, and 120 mm. Hg. diastolic. The lowest blood pressure recorded was 150/100. There were retinal changes in all the cases, and in 15 the findings were those which are characteristic of hypertensive neuro-retinitis. An outstanding feature was well marked albuminuria and abundant urinary sediment. The sediment contained numerous red blood cells, white blood cells, and casts of a hyaline, cellular and granular nature. It is important to note that oedema was absent in 79% of cases. The majority of the patients showed a well marked secondary hypochromic anæmia; 17 had a red blood cell count of less than 4,000,000; 19 had a hæmoglobin of less than 80%: in 16 of these the hæmoglobin was below 59%. The anæmia was for the most part most marked in those who had had nitrogen retention for some time. The relatively normal blood counts occurred in those cases which developed a rapidly progressive nitrogen retention a short time before death. Most of the patients were admitted in uræmia. The average urea nitrogen content of the blood was 143 mgm. A few who had normal blood chemistry on admission, rapidly developed nitrogen retention.

At autopsy the heart was hypertrophied in all the cases. The heart weighed below 400 gm. in only one male, and below 350 gm. in only one female. The average heart weight was 540 gm. in the males, and 450 gm. in the females. Pericarditis was present in 8 cases. The combined weight of the kidneys was smaller than normal, and averaged 243.5 gm. for males, and 260 gm. for females. In one-half of the cases the kidneys weighed less than 250 gm., and in one-third, less than 200 gm.

Microscopically, the kidneys showed varying degrees of tubular atrophy, glomerular, vascular, and interstitial changes. Most of the glomerular capsules showed thickening. The capillary bed of the glomeruli was considerably distorted and thickened due to fibrosis of vary-

ing degree. The arterioles showed hyaline thickening of the subendothelial layer of the intima, the effect of which was to narrow the lumen and often to completely close it. Inter-tubular arteries showed intimal thickening with reduplication of the internal elastic lamina, as well as narrowing of the lumen. Of the above 23 cases who died in uræmia, 6 showed the malignant type of arteriolar nephrosclerosis. The microscopical characters of the glomeruli and tubules in this small group of six cases were, in general, similar to those in the remaining 17 cases, all of which were of the benign type. There was, however, this striking difference: the arterioles and smaller arteries showed varying degrees of active necrosis of their walls, and, in addition, there were focal, irregularly distributed areas of necrosis in the kidney parenchyma. These changes indicate a rapid, progressive process.

Sub-group B—Those who died a cardiac death.—This group contains 15 cases: 11 males and 4 females. Their ages vary from 31 to 62 years, the average being 51 years. All except one were over 40. While in all cases the actual cause of death was cardiac failure, some of them, as will be seen, showed other pathological conditions that were important contributing factors. The clinical signs and symptoms varied from 8 months to 18 years; the average was 5.2 years. The blood pressure varied from 140/40 to 255/150. The average systolic was 195.5 and the diastolic 117 mm. Hg. The fundi of the 8 cases upon whom a report is available revealed abnormal findings in all but 2 cases. Three showed hypertensive neuro-retinitis, 2 arteriosclerotic retinitis, and one vascular changes only. Œdema was one of the outstanding features and was present in all the cases. In 5, it was graded as +, in 6 as ++, and in 4 as +++. Albuminuria occurred in all the cases. It was graded as a trace in 9, and as a large trace in 7 cases. The urinary sediment was abnormal in all of the 14 cases in which a record was available. Red blood cells were present in 7, or 50%; white blood cells and urinary casts were present in 14, or 100%. The red blood cell count was reduced in all but one case; the average was 3,820,000. The hæmoglobin was likewise reduced, averaging 68.5%. The blood urea nitrogen was recorded in 13 of the 15 cases. It was normal in 3, increased in 10, and averaged 60 mgm. Blood creatinine was likewise recorded as normal in 2, increased in 11, averaging 3.2 mgm.

At autopsy, a striking feature was the enormous increase in size and weight of the heart. In the males it varied from 460 to 920 gm., the average being 759 gm.; and in the females it varied from 390 to 670 gm., averaging 540 gm. The kidneys were increased in size and weight in most instances. The combined weight of the kidneys averaged in the males 407 gm., and in the females 389 gm. In only one case was it less than 250 gm.

Microscopically, the kidneys showed changes in the glomeruli, tubules, interstitial tissue and arteries. Areas of hyalinization of glomeruli was noted in 13 cases. All the cases showed some atrophy of the tubules, but in only three instances was this a prominent feature. Arteriolar nephrosclerosis was noted in all the 15 cases—100%. It was graded slightly in 6, moderate in 2, and marked in 7.

Sub-group C—Arteriolar nephrosclerosis with death due to cerebral causes.—This group consists of 22 cases, 12 males and 10 females. The youngest was 23 and the oldest 74 years old. Over half were in the fifth decade; the average age for the whole group was 54 years. All the patients had had signs and symptoms, or both, referable to the central nervous system for an average of two years. In some, these were the most outstanding clinical features. The majority of this sub-group were admitted to the hospital on account of their cerebral signs or symptoms, or they developed these while under observation. Hypertension was known to have been present in all the cases for more than 5 years. In 76%, the blood pressure was above 200, and the diastolic above 100 mm. The average blood pressure was 220 systolic and 120 diastolic. Retinal changes were prominent. Of the 14 cases reported upon 12 (86%) showed abnormalities, and of these 5 were of the hypertensive neuro-retinitis type. All cases showed albuminuria, and moderate numbers of red blood cells, white blood cells and casts in the urine. Œdema, anæmia, and nitrogen retention were practically negligible in this group. In five cases, 22%, slight œdema was noted. The average red blood cell count was 4,290,000, and the hæmoglobin 74%. The average blood urea nitrogen was 57 mgm. %.

At post-mortem the heart was hypertrophied in all but three cases. The average weight was 525 mgm. The average combined weight of the kidneys was approximately normal, 304 gm.

Group	Histology	No. of cases	Age	Male	Female	Symptoms	Disease	Fundi % changes	Edema %	Blood pressure	Albumin %	Hæmo-gram.		Blood urea nitrogen	Heart weight	Kidney weights	Liver weights	Cause of death
												R.B.C. millions	Hæmo-globin %					
I	Acute interstitial nephritis	6	11 68	4	2	4 dy.	0	0	0	125 64	100	4.4	80	111	356	430	1516	Bacteriæmia. 4 Broncho-pneumonia 1 Uræmia..... 1
II	Subacute glomerulo-nephritis	11	38	9	2	2 yr.		60	81	178 101	100	2.9	54.8	130	486	463	1925	Uræmia..... 8 Cardiac failure..... 2 Lobar Pneumonia.... 1
III	Chronic glomerulo-nephritis	12	44	11	1	3 yr.		88	50	185 103	100	2.6	49	128	458	227	1765	Uræmia.... 11 Intercurrent infection.. 1
IV A	Arteriolar nephro-sclerosis	23	45	14	9	1.5 yr.	3.8 yr.	100	21	205 128	100	3.2	59	143	508	250	1658	Uræmia
B	"	15	51	11	4	5.2 yr.		75	100	195 117	100	3.8	68.5	60	714	402	1908	Cardiac
C	"	22	56	12	10	2 yr.	5 yr.	90	22	220 121	100	4.3	74	57	525	304	1600	Cerebral
D	"	10	50	5	5	3 yr.		100	30	192 107	100	2.9	53	72	515	248	1681	Intercurrent causes

one from purpura hæmorrhagica in a syphilitic. Four cases died as the result of infection. Of these, 2 died from lobar pneumonia types III and IV. One died from a staphylococcus septicæmia, and one died from peritonitis due to rupture of multiple liver abscesses. The final one died from cholecystitis complicated by jaundice.

DISCUSSION

In our type of hospital population, during the period studied, 1931 to 1938 inclusive, arteriolar nephrosclerosis constituted 70.7% of deaths from Bright's disease. Glomerulonephritis ac-

counted for 23.23% of deaths. The remaining cases were classified as acute interstitial nephritis. This condition is not uncommonly associated with infectious diseases and septicæmia in children.^{1, 2} We have already stated it as our opinion that interstitial nephritis is not much more than a morphological concept, is rarely diagnosed, and its pathogenesis little understood. It may be that with further studies this entity may prove to have some relationship to chronic forms of Bright's disease.

We were unable to find in the pathological records of the Department of Pathology, a single case in which death was ascribed to acute

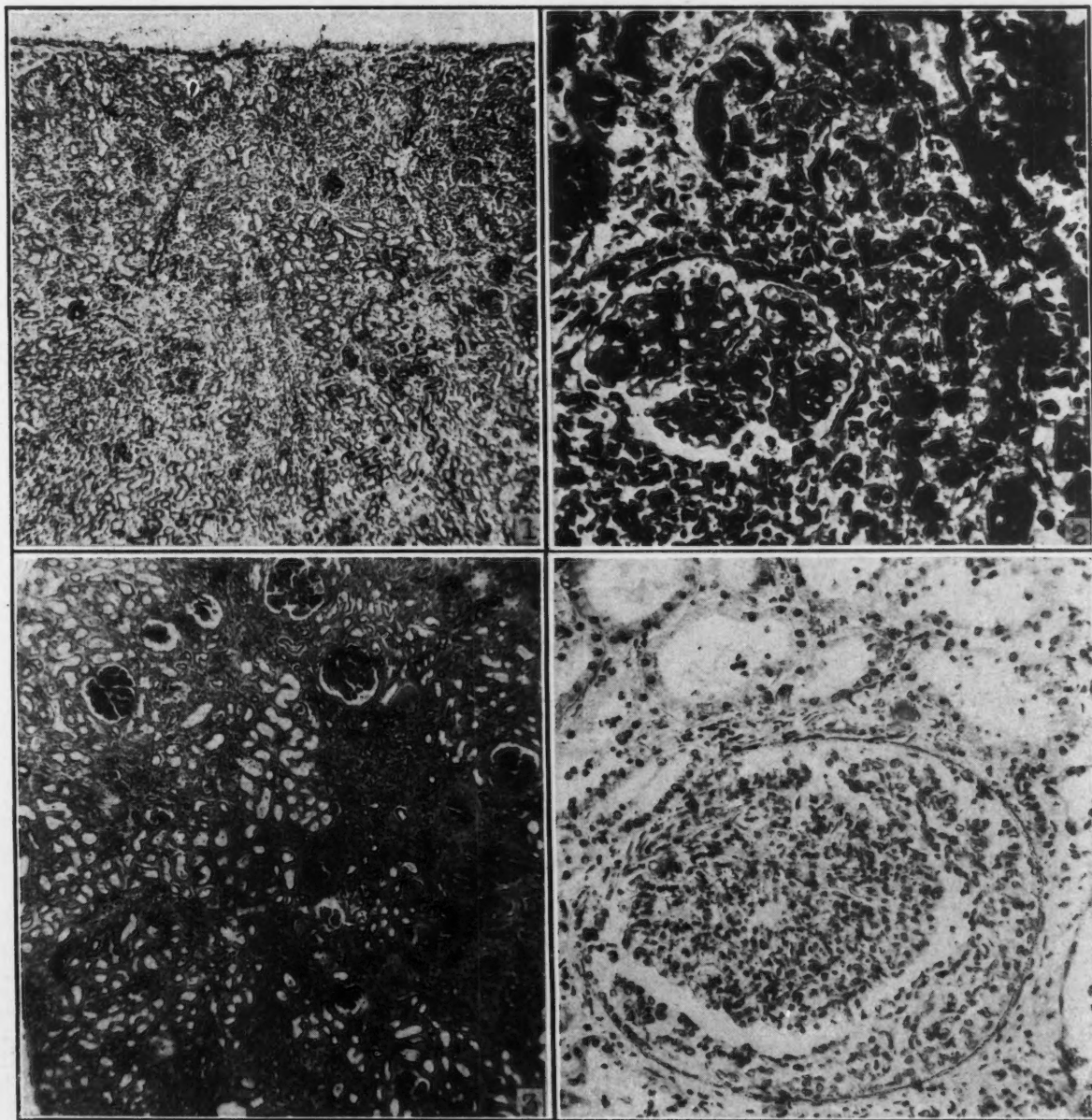


Fig. 1.—Diffuse infiltration and interstitial œdema masking normal architecture. Fig. 2.—Higher power showing interstitial cellular exudate. Extensive tubular degeneration. Fig. 3.—Low power, upper left field shows relatively well preserved architecture. Lower right field shows extensive tubular atrophy and organizing glomerulitis. Fig. 4.—High power, showing glomerulitis and crescent formation.

glomerulonephritis. This is not surprising when it is considered that there are few beds for children in our hospital and that cases of acute glomerulonephritis most commonly recover. Others,^{3, 4, 5, 6} have also pointed out that the prognosis for life is good in acute glomerulonephritis.

On the other hand, deaths from subacute and chronic glomerulonephritis is numbered 23, about 0.7% of the total mortality in the hospital. This comparatively low incidence of glomerulonephritis is in agreement with Bell⁷ and others, who point out a change in the at-

titude of the profession toward a more exact diagnosis resulting in more reliable vital statistics. The high incidence of Bright's disease in present vital statistics is due to the inclusion of a large number of cases of primary hypertension which show albuminuria and oedema resulting from myocardial failure.

When the clinical and pathological data on the cases of subacute and chronic glomerulonephritis were compared, certain features are striking (see Table I). Those who died in the subacute stage were young; the known duration of the disease was shorter; oedema was more

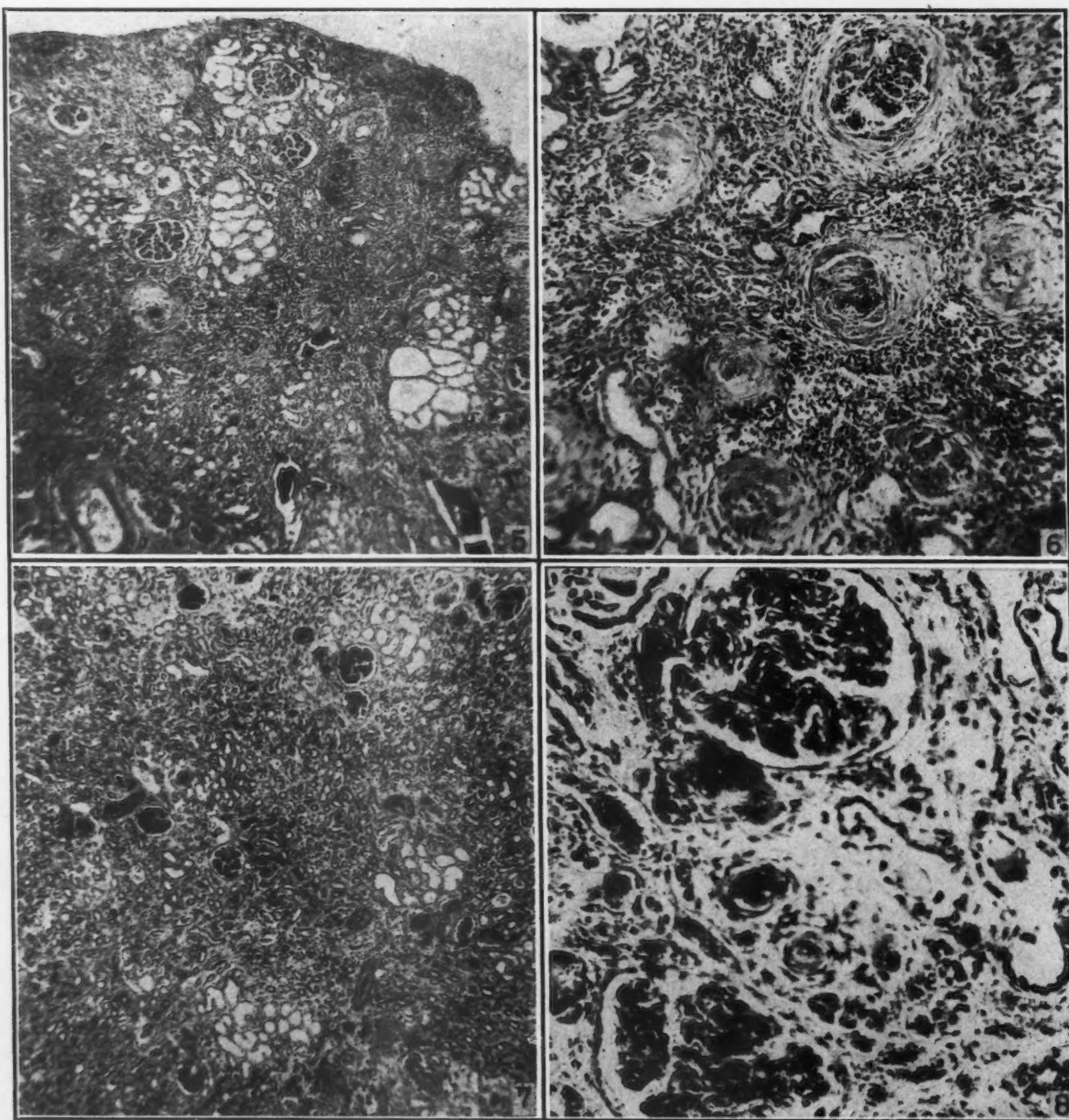


Fig. 5.—Chronic glomerulonephritis showing advanced glomerular lesions and extensive tubule atrophy, with intervening dilated tubules containing casts. **Fig. 6.**—High power, showing details of varying stages of glomerular obliteration. **Fig. 7.**—Note fairly well preserved glomeruli, marked hyperplastic arteriosclerosis of small arteries. Marked tubular atrophy. **Fig. 8.**—High power, showing marked arteriolar hyaline swelling and obliteration leading up to the glomerulus. The same hyaline swelling is seen in some of the glomerular loops.

marked; the kidneys were larger; and hypertension, changes in fundi, and the degree of anæmia and nitrogen retention were less marked.

There is also a sharp histological difference between the subacute and chronic groups. Among the 23 cases of glomerulonephritis there were a few in which it was difficult to decide, because the lesions were not sufficiently clean-cut to make a precise differentiation. Uræmia was the commonest cause of death in these two groups. It was present in 78% of the cases. A careful histological examination of the cases was made before any attempt was made to classify them (see Figs. 1 to 8).

When the arteriolar nephrosclerotic group, which constituted the highest incidence, were classified according to cause of death, several interesting facts evolve. The cases dying as a result of uræmia, accounted for the largest number of deaths, 32.85%; they occurred at an earlier age and presented the shortest clinical course. Next in order of incidence, in this large group were those dying from cerebral hæmorrhage, followed by those with a cardiac death, and finally those succumbing to intercurrent infection.

Deaths due to uræmia occurred at the average age of 45 years, those with cardiac failure at 51 years, and those from cerebral hæmorrhage at 56 years, whilst the average age of those dying from intercurrent disease was 50 years. This incidence is contrary to the general experience of others,^{8,9} which reveals that those who succumb to high blood pressure in hospitals generally, are, in order of frequency—cardiac failure (32%), cerebral accident (25%), and a small percentage (4 to 5%) from uræmia, or with some renal disease. However, when age is considered, our experience somewhat favours the common impression that the younger group die of renal insufficiency, followed by cardiac failure which occurs in the fifth decade, and this is followed by cerebral deaths. Those dying from intercurrent causes, approximate in age those who succumb to cardiac failure.

Considering the ages of patients with glomerulonephritis as opposed to those with arteriolar nephrosclerosis—the ratio 23:70 is comparable to figures quoted by Fishberg,¹⁰ 10:72 and 58:656. Arteriolar nephrosclerosis is predominantly, then, a disease of the declining years of life, whereas glomerulonephritis occurs in younger people, so that the age incidence curves of these two conditions cross one another.

Other features of note in the arteriolar-sclerotic patients were the presence of œdema in 100% of the cardiac group, but in the remaining three groups it was not a feature (see Table I).

Anæmia was most marked in the presence of renal insufficiency and those dying from intercurrent causes associated with hæmorrhage. In all cases the heart weight was increased, especially in the cardiac death group where it was most pronounced. The smallest kidneys were reported in the uræmic group, whilst those in the cardiac group tended to be large. The liver weights were only significant in patients with heart failure.

Certain findings, though common to all the groups of arteriolar nephrosclerosis, were of little aid in differential diagnosis; namely, the urinary findings, the degree of hypertension, the extent of changes in the fundi, and the degree of nitrogen retention. Albuminuria, hæmaturia, pyuria, cylindruria, were extremely variable. The blood pressure, as a rule, was high, but most marked in the uræmic and cerebral groups. Fundi changes occurred in approximately 100% of cases, except the cardiac group, where this incidence was 75%. Nitrogen retention, as one might expect, was most marked in the cases with renal insufficiency.

The microscopic picture of the kidneys in the arteriolar nephrosclerotic group varied enormously. The most characteristic lesion was found to be a peculiar hyaline thickening of the subendothelial layer of the intima of the small arterioles, particularly the afferent arterioles. Changes in the glomeruli, tubules, and interstitial tissue also varied extremely. These changes give no clue as to the cause of death, except in the small group which showed necrosis and focal areas of acute degeneration, indicative of the "malignant process".

Finally, it seems to us that the greatest difficulty in arriving at a clinical diagnosis as to the type of nephritis present will be encountered in those who are first seen with uræmia. In such cases it may be impossible to tell whether the primary process was glomerulonephritis or arteriolar nephrosclerosis. In our total number of cases, 35% showed uræmia, and they all belong to the same age-group. Given any particular case, the duration of the symptoms, the urinary findings, the degree of hypertension, nitrogen retention, and anæmia, the presence or absence of œdema, and the fundi changes, may

all be of the same comparative severity in both chronic glomerulonephritis and arteriolar nephrosclerosis.

At post-mortem, the cardiac hypertrophy and extent of contracture of the kidneys often approximate each other.

In our experience the arteriolar nephrosclerotic group will outnumber the glomerulonephritis group by two to one. As pointed out above, there are cases where only the histology of the kidneys will reveal the true nature of the process.

If a person has Bright's disease, every measure should be taken to arrive at an exact diagnosis of the type that he has, because both treatment and prognosis will depend upon this. A careful history and a complete examination, including laboratory aids, if properly evaluated, will in the majority of cases, allow one to place patients with Bright's disease in one of the main groups discussed in this paper.

Dr. Lawrence J. Rhea, and Dr. J. E. Pritchard gave valuable advice in the preparation of this paper.

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"When we take an x-ray film we are filled with wonder at the complications of nodes and shadows, not sufficiently realizing that what we are gazing at is the picture of past battles, filled-in trenches, exploded mine-craters and the like. What we imagine we see, but do not, is the advancing army of disease."—*Papers of a Pioneer*, Sir Pendrill Varrier-Jones.

BRONCHOPULMONARY SUPPURATIONS TREATED WITH INSTILLED SULFATHIAZOLE SOLUTION*

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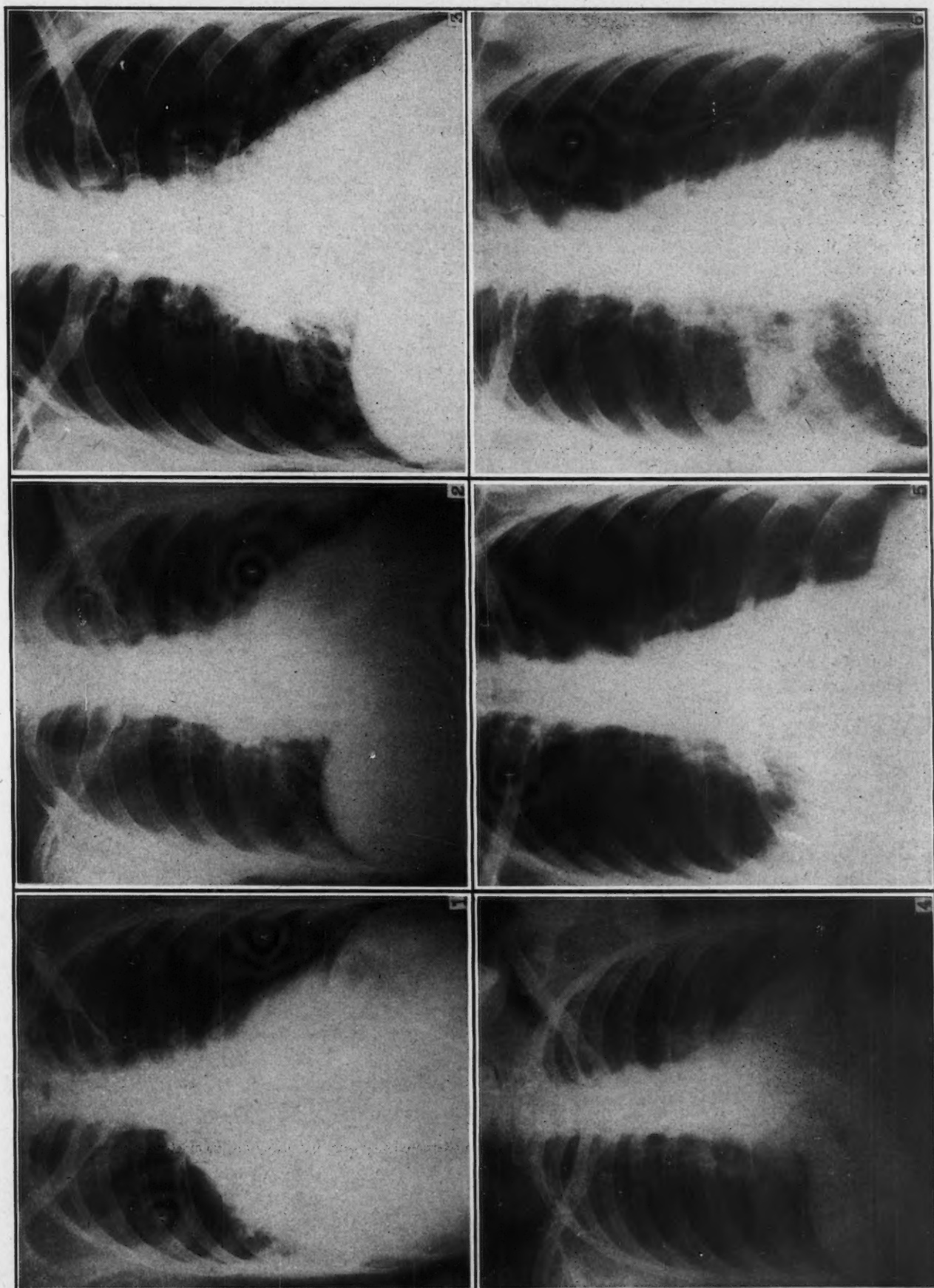
SEVERAL years ago Chevalier Jackson¹ stated that "the bronchopulmonary suppurations are successfully treated by bronchoscopic aspiration, suction-irrigation, and the instillation of medicaments after the injection of an anæsthetic to favour their retention." Different solutions have been advised: gomenol oil, 10 to 20%; lipiodol, 20 to 40%; mereresin, 10%; metaphen, 1/1,000, the chlorinated solution being too irritating. Isotonic aqueous is considered the best medium.

Now, the sulfanilamide compounds have become the drugs of choice for almost every focal infection, but until the present time it has been recognized that the sulfathiazole sodium solution had irritative effects on any mucous membrane. In June, 1941, we had been impressed with the good results obtained by using sulfathiazole sodium 5% solution in injection through the tympanic membrane after an aspirating puncture for treatment of the acute or sub-acute otitis media. No caustic reaction has been observed, but the symptoms subsided and disappeared in a rather short time, and the permeability of the Eustachian tube was restored.²

In July, 1941, we had a case of lung abscess which did not satisfactorily respond to bronchoscopic drainage and antiseptic irrigations. Then we decided to use the sulfathiazole sodium 5% solution in irrigations and instillations through the bronchoscope or the laryngeal cannula. The wonderful cure resulting was published last year³ and represents the first case of the actual series (Figs. 1 to 4). In the literature we found no reference to this new method of chemotherapy. The only article published is that of M. R. Cassex, E. L. Capdehourat and A. Lavarello (Argentina), who nebulized neoprontosil for the treatment of purulent bronchiectasis.⁴

Recently, L. G. Hunnicut's conclusive experiments⁵ make it obvious that sulfathiazole sodium in 5% solution is practically inoffensive to the mucous membrane of the upper respiratory tract. Some inflammatory reaction takes place

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during the first three days and on the fourth day the mucous membrane becomes normal, even if the use of sulfathiazole sodium be continued for several weeks.

In our clinic, from July, 1941 to September, 1942, the sulfathiazole sodium was preferred to other related compounds, on account of its wider specific polyvalent action against the lung infections, and its local bacteriostatic activity. We have in mind that the majority of lung abscesses have already passed the acute stage and the cases, when seen, are in their period of chronicity. On the other hand, the sulfanilamides, used locally, are active so long as they are employed in sufficient amount.⁶ Among these, the sulfathiazole sodium is available in the strongest solution, which is one of 20%. The only objection to its introduction into a mucosa-lined cavity is its irritative action. After several bronchoscopic examinations, we have never seen that caustic effect on the bronchial mucous membrane. In one case, a partial bronchial stenosis disappeared after the good cleansing apparently due to the sulfathiazole sodium instillation. Bacteriologically, the mucopurulent secretions become negative faster with sulfathiazole than with antiseptic mercuric compounds.

METHOD OF TREATMENT

Bronchoscopic irrigation.—When the patient is referred to the clinic for his first treatment we perform bronchoscopic examination and aspiration. If no marked bronchial stenosis be present, 10 to 20 c.c. of sulfathiazole sodium in 5% solution are instilled and at once partially aspirated. This procedure may be repeated two or three days later if there is a large amount of secretion.

Laryngoscopic instillation.—During the first week after the irrigation, 2 to 5 c.c. of the solution are poured down daily into the trachea through the laryngeal cannula under mirror guidance, after local anaesthesia as practised for bronchoscopy. For the next two weeks the instillation is repeated every other day and, later on, twice or once a week, as much as the clinical and radiological signs seem to require.

When the operator wishes to inject a particular lung, he must have the patient lean to either side. Instead of the laryngeal cannula one may use the catheter method as employed for bronchography, specially in children. The laryngoscopic technique is very convenient in clinic or private practice.

ILLUSTRATIVE CASES

CASE 1

E.L., aged 50 years, housewife, was admitted to Notre Dame Hospital on May 5, 1940. In December, 1939, after a period of neglected "grippe", she showed signs of bronchopneumonia. In May and June, 1940, Dr. Jules Prevost, from the medical staff, made the diagnosis of right lower lobe abscess and had the patient under treatment. On account of her poor condition she did not respond to any medical therapy nor did she tolerate sulfanilamide compounds in any way. Then Dr. Prevost requested us to see her, when presenting the following signs: vomiting, cachexia, fetid mucopurulent expectoration, temperature between 99 and 102°, and positive x-ray findings of extensive right lower lobe abscess (Fig. 1).

On July 22 we performed a bronchoscopic examination, revealing copious fetid mucopurulent secretion with blood staining, acute inflammatory reaction of the mucous membrane, which appeared swollen, and partial stenosis of the bronchus of the right lower lobe. From July 23 to August 17, once or twice a week, we repeated the bronchoscopic drainage, completed with irrigations of mercuric 10% solution. The temperature became normal after July 24. Daily, from August 1, we added 15 minutes postural drainage on the Schindler table. Later on, bimonthly or monthly, the bronchoscopic drainage was continued, with the result shown by the roentgenogram of February 10, 1941 (Fig. 2).

On June 17, 1941, the patient came back to the bronchoscopic clinic with a history of relapse: chill, moderate temperature, productive cough (Fig. 3). Hospitalization immediately followed and a bronchoscopic drainage was done, to which we added a large irrigation with 20 c.c. of sulfathiazole sodium, 5% solution. Afterwards, under indirect laryngoscopy, instillations of 2 to 5 c.c. of the same solution were injected 2 or 3 times a week, until June 28, and once a week during July and August. In the meantime postural drainage completed the treatment. The patient left the hospital on July 10, to come to the out-patient clinic.

During this second period, no bronchoscopic treatment was done because we wanted to be sure of the effect of the local bronchial chemotherapy. But, on August 26, 1941, a bronchoscopic examination showed a normal bronchial mucosa and very little secretion which was negative. The patient, on March 23, 1942, had put on some 20 pounds and her condition has remained satisfactory. X-ray shows clearing of the lung (Fig. 4).

CASE 2

C.L., aged 11 months. On his admission to the Notre Dame Hospital, on February 23, 1942, he was dyspnoeic, cyanotic, and toxic. On February 25, in consultation with Dr. L. Guilbeault, we found a tremendous retropharyngeal abscess with acute laryngitis. The temperature was 105° and the baby looked almost dying, his face pale as wax. We performed an emergency low tracheotomy, just before opening the abscess, from which 8 oz. of fluid greenish pus were evacuated. Since a large amount of mucopurulent secretion was expectorated through the tracheal cannula we applied the Jackson's catheter method of treatment, advised for acute laryngo-tracheo-bronchitis. Instead of instilling physiological saline solution, we used the sulfathiazole sodium 5% solution in the same manner, day and night, for 3 days. On the fourth postoperative day the temperature was normal and the baby was doing very well, and the tracheal tube was removed. An x-ray film taken on March 2, 1942, showed a good result.

CASE 3

F.L., a single female, aged 42 years, consulted Dr. A. Joannette, of Ste. Agathe des Monts, for moderate productive cough and pain in the right side of the chest. He made the diagnosis of right lower lobe abscess as shown in Fig. 5. Because of the objection of the patient to any surgical treatment (lobectomy), advised because the pulmonary lesion had been con-

tinuing for over two months, she was referred to us for bronchoscopic examination, bronchography and intrabronchial chemotherapy.

At the bronchoscopic examination we found mucopus coming from the right lower lobe bronchus with slight partial stenosis just below the middle lobe orifice. Then, after one bronchoscopic drainage and six laryngoscopic instillations as previously described, the patient showed wonderful improvement. She was advised to come back, but failed to report. Of course, this patient may have a recurrence due to incomplete treatment. Nevertheless, the radiograph which still shows some residual lipiodol, must be considered as a proof of the good action of sulfathiazole sodium solution used locally in the bronchi (Fig. 6).

CONCLUSIONS

We have drawn attention to the possibility of dealing with bronchial suppurations (abscesses and bronchiectasis) and treating successfully these pathological conditions with irrigations and instillations of sulfathiazole sodium solution.

The sulfathiazole sodium, 5% solution, appears superior to the mercuric antiseptic solutions.

It seems to have practically no irritative effect on the bronchial mucous membrane. We did not see any drug deposits on the mucous surface, nor bleeding due to its use. The bactericidal and bacteriostatic action of the medicament favour the regeneration of the inflamed mucous membrane and check the formation of mucopus in a purulent cavity. Indeed, in two cases the partial stenosis due to swelling disappeared.

The sulfathiazole had a favourable influence on the course of the disease. This is specially true when we use our method of treatment in patients with whom the peroral or parenteral chemotherapy is impossible, and any further intoxication must be prevented. Consequently, this procedure should be of great help in the preoperative care of patients for thoracic surgery.

The method above described was successfully employed on children, and may be applied in clinic or private practice.

We are indebted to Drs. J. Prevost, L. Guilbeault and A. Joannette for their co-operation. Our gratitude is due to Poulenc Frères Laboratories, Montreal, for their courtesy in supplying the sulfathiazole sodium product.

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RÉSUMÉ

L'on peut avantageusement employer le sulfathiazole sodé en solution à 5% en instillation ou irrigation intrabronchique pour traiter les suppurations bronchopulmonaires. La méthode consiste d'abord dans une irrigation bronchoscopique de 20 c.c. et dans l'instillation laryngoscopique de 2 à 5 c.c., 2 ou 3 fois par semaine les jours suivants.

Chez le premier cas rapporté, un large abcès du lobe inférieur droit, le drainage bronchoscopique complété d'irrigations (Mercrezin 10%) fut suivi d'une rechute un an plus tard. Alors la sulfamidothérapie locale amena la guérison. Elle fut appliquée avec succès chez un enfant de 11 mois présentant une bronchite muco-purulente consécutive à un abcès rétropharyngien (la sonde intratrachéale fut employée). Le 3e cas, un abcès du lobe inférieur droit est en voie de guérison après 6 instillations laryngoscopiques.

Parmi les conclusions, il est à retenir que la maladie évolue rapidement vers la phase bénigne; que le nombre de bronchoscopies est réduit à 2 ou 5 séances; que la méthode s'applique surtout aux grands intoxiqués et dans la préparation des malades à la chirurgie pulmonaire; que ce procédé s'adresse autant aux broncheectasies qu'aux abcès pulmonaires.

RIBOFLAVIN AND VITAMIN A IN RELATION TO "EYE STRAIN"

By Lionel Bradley Pett, Ph.D., M.D.

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TWO vitamins, riboflavin (of the vitamin B-complex) and vitamin A, have been specifically mentioned in connection with various eye conditions, including "eye fatigue" but the evidence is not complete. A nutrition survey has been carried out on a group of people who read handwriting all day, and work under fairly uniform conditions of lighting, etc., from whom many complaints of "eye strain" have been received. The group represents ages from 21 to 70, with a preponderance over 40 years. They are nearly all university graduates.

METHODS

The procedure followed may be itemized as follows:

1. Each person kept a dietary record of kinds and amounts of food eaten for seven consecutive days during February, 1943.

2. An examination was made by means of a biomicroscope for conjunctival opacities (supposed to be due to vitamin A deficiency) and of corneal vascularization (supposed to be due to riboflavin deficiency). In the latter case a

record was made of the appearance at the limbus between 5 and 7 o'clock of the circle. A deficiency was counted only if the limbus was actually crossed (*i.e.* nearby engorgement was not considered).

3. An alphabetical list of the whole group was then divided into three parts by placing an A opposite the first name, B opposite the second name and C for the third name, and repeating the letters to the end. With only a few adjustments this method served to give each of the three groups an approximately equal number of persons (*a*) showing no deficiency by this test; (*b*) showing a presumed riboflavin deficiency and (*c*) a presumed vitamin A deficiency. The final results given in Table II are not quite equal owing to a variable number in each group who did not complete the experiment.

4. Group A received a daily capsule containing 10,000 I.U. of vitamin A, group B received a similar-appearing capsule containing 3 mgm. riboflavin, and group C received a similar capsule of inert material. The group as a whole did not know what vitamins were being used, nor that they were divided into three parts. It was not possible to give the capsule individually daily, but seven capsules were provided in an envelope for each person at work weekly, and were re-issued only on assurance that the previous capsules had been taken.

5. The capsules were continued for ten weeks, which is short according to some investigators, but according to others should give useful information.

6. A re-examination by the biomicroscope was made and recorded without reference to the original findings.

7. During the experiment a short questionnaire was circulated to elicit subjective comments.

RESULTS

Numbers.—There were 273 volunteers for the survey, 251 completed dietary records, and 232 received the second eye examination.

Dietary study.—The following table summarizes the results obtained. It is clear that dietary improvement is definitely needed by the group as a whole.

Vitamin deficiencies.—At the first examination, out of 273 people, 38% showed no evidence of deficiency by the biomicroscope, 40% showed presumed vitamin A deficiency and 37% showed

TABLE I.

MILK—	
2%	had no milk on any day during the week
11%	did not drink milk on any day during the week
54%	had less than the recommended minimum of 10 oz. milk daily
CHEESE—	
24%	had no cheese during the week
FRUITS—	
28%	did not have fruit every day
54%	did not have citrus fruit or tomatoes daily
VEGETABLES—	
93%	did not have 3 servings of vegetables daily
66%	did not have green or yellow vegetables daily
CEREALS—	
51%	did not have a whole grain cereal during the week
91%	did not have a whole grain cereal daily
72%	had less than 4 slices of bread daily
MEAT—	
Practically all had a serving of meat daily	
EGGS—	
43%	had less than 4 eggs weekly

presumed riboflavin deficiency (12% showed both). At the second examination, three months later, out of 232 people, 43% showed no deficiencies by this test, 41% showed presumed vitamin A deficiency, and 27% showed riboflavin deficiency (10% showed both). The following table gives a better indication of results for the 232 examined.

TABLE II.

SHOWING NUMBERS OF PERSONS UNDER EACH DIAGNOSIS AND TREATMENT AT THE BEGINNING AND END OF THE EXPERIMENT (3 MONTHS)

Biomicroscopic evidence of vitamin deficiencies	Vitamin A treatment		Riboflavin treatment		Placebos	
	Start	End	Start	End	Start	End
None.....	31	36	26	32	28	31
Vitamin A.....	22	22	20	23	20	26
Riboflavin.....	21	20	17	10	14	8
Both.....	10	6	11	9	12	9
Totals.....		84		74		74

DISCUSSION

The following points should be noted:
Vitamin A.

1. Of 32 persons showing presumed vitamin A deficiency at the start, and receiving vitamin A therapy, four persons (or 12%) lost these signs in three months.

2. Of 63 persons showing presumed vitamin A deficiency at first, and receiving *no vitamin A treatment*, all showed these signs at the end.

Riboflavin

3. Of 28 persons showing presumed riboflavin deficiency at the start, and receiving riboflavin therapy, sixteen had lost these signs at the end.

This is an apparent cure of 57% (but see below).

4. Of 57 persons showing presumed riboflavin deficiency at the start, and receiving *no riboflavin treatment*, only 33 showed the same signs after three months. Thus 24 persons or 42% showed recovery without treatment of the signs taken to mean riboflavin deficiency.

This high incidence of "spontaneous cures", namely 42%, emphasizes the importance of controls to assist in the interpretation of therapeutic results with riboflavin. This importance does not seem to have been previously appreciated.

The observation also has a bearing on current discussions regarding biomicroscopic observations of corneal vascularity as evidence of riboflavin deficiency. For example see Riggs *et al.*¹ and Tisdall *et al.*² The changes observed may have arisen from one or more of various causes, including the following: (1) incorrect diagnosis at the start; (2) change in diet; (3) "spontaneous cure"; (4) self-treatment; (5) incorrect final diagnosis. The group was requested not to vary their diet nor to treat themselves.

It seems probable from the work of others that pericorneal injection, and engorged capillaries at the limbus are frequently not related to riboflavin deficiency and to this list must now be added some of the cases of actual corneal vascularity.

Nevertheless there remains a residue of cases diagnosed riboflavin deficiency, and responding to riboflavin treatment. It is probably significant that *in this group* there was reported more relief of various symptoms, including watery and red eyes, than in the other groups, even though the picture is complicated again by subjective reports of "improvement" from people in all groups—with or without treatment or observed changes. The time involved is still too short to make definite statements on this possible relationship of vitamins to "eye strain".

SUMMARY

Observations have been made on 232 persons doing constant reading under uniform conditions of the incidence of presumed deficiencies of vitamin A and of riboflavin. Treatment produced a small effect (12%) by vitamin A, and a large effect (57%) by riboflavin. The latter is offset by the large number (42%) of diagnosed riboflavin deficiencies which cleared up without treatment during three months. Among

the remainder subjective improvement in "eye strain" was slightly more common than in the other groups. The importance of suitable controls thus receives a new emphasis in the current discussion over this biomicroscopic method of diagnosis.

Grateful acknowledgment of assistance is made to several officials in the Department of National War Services and in the Post Office Department, as well as to the staff of Nutrition Services.

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RÉSUMÉ

Deux cent et trente-deux sujets soumis à la lecture dans des conditions uniformes sont observés en vue de déterminer la fréquence des soi-disant déficits en vitamine A et en riboflavine. Le traitement par la vitamine A ne produisit qu'un effet restreint (12%) tandis que le traitement par la riboflavine donna de meilleurs résultats (57%). Cependant, 42% des cas diagnostiqués déficients en riboflavine guérissent sans traitement. Cette constatation doit faire souligner l'importance des témoins bien observés lorsque l'on étudie l'action de la vitamino-protection.

JEAN SAUCIER

THREE YEARS OF NEUROPSYCHIATRY IN THE CANADIAN ARMY (OVERSEAS)

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PART I.

INTRODUCTION

THIS survey is largely historical, and its purpose is chiefly to give a general background of the problems encountered, and the measures taken to meet them during the first three years of experience in the Canadian Army (Overseas).

Although some statistics are given, it must be remembered that the greater part of the C.A.(O) has not yet been in action, and the acute "war neuroses", commonly seen after sustained battle action, have been negligible. It would, therefore, be unwise to place much reliance on these statistics in predicting future casualties.

As has been pointed out by many writers, modern war does not produce any new clinical entities. On the other hand, it does bring to

the fore many of the well known psychiatric disabilities, and presents problems of disposal or effectual employment of the affected personnel, which differ from those encountered in civilian practice, or even in the first Great War. The use by the rank and file of many complicated technical devices, the maintenance and operation of automatic weapons, the mechanization of transport and fighting vehicles, even the use of automatic vegetable-peeling machines in large base camps and hospitals—all tend to restrict the effectual employment of the mentally defective, the dull normal and the psychoneurotic soldiers, who were formerly employed at menial tasks such as the sanitation of the horse lines. To give another example, claustrophobia, which is very common, and, in its milder form is not disabling in civil life, may become a high disability endangering the lives of others when it occurs in a member of a tank crew who has seen his comrades burned to death or seriously wounded in a damaged tank with the exits jammed.

We find that our problems have much more in common with those of the British Middle East Force and the American Army in Britain than with the British or Canadian Home Forces. We are only indirectly concerned with the screening-out of the unfit at the point of intake. We are only concerned with the long treatment cases in that we make the decision that they are in this class, and initiate treatment pending evacuation to Canada. Although we are interested in rehabilitation, we must not lose sight of the fact that our primary function is early diagnosis, early treatment, and, above all, early disposal of the unfit, so that they may not become an impediment.

CHANGES IN POLICY AND ORGANIZATION

During the past year, there have been radical changes both in policy and organization of neuropsychiatry in the C.A.(O). Decentralization has taken place. The Canadian Neurological Hospital has become a special base hospital with increased bed space and personnel. As a result of this, an increasing number of psychotic patients of the type formerly sent to British military mental hospitals are retained there; and it is expected that very shortly they will include all except those few who require special treatment such as electric shock therapy.

In order to give unit medical officers, administrative medical officers of formations and personnel selection officers the benefit of a specialist's service close at hand, regional neuropsychiatrists have been appointed. These are authorized on the basis of one per Division with additional ones for Canadian reinforcement units, etc.

In collaboration with the personnel selection board, an intensive effort is being made to salvage a greater proportion of the psychiatric casualties of the type who were formerly returned to Canada or were ineffectual in their units. Although the most obvious progress in this direction is shown by the excellent work which has been done in the General Pioneer Companies, which accept only men of stable personality but less than average mental capacity, there has been considerable success in placing neurotic patients of normal intelligence in work more suitable to their capabilities. In addition to placing such men suitably within their own Corps and at C.R.U., a group of this type is being segregated in a special Pioneer Company. This is still in the experimental stage.

Consideration is being given to the advisability of setting up a special unit for the segregation and training of soldiers of psychopathic personality, of average or better intelligence, who have become disciplinary problems. The more obvious cases with long histories of anti-social behaviour, serious civilian and army crime records or sex perversion will still be returned to Canada on medical (psychiatric) grounds.

In order to appreciate the necessity for the above changes in policy and organization, and for still further changes, a survey of neuropsychiatry in the C.A.(O) will be helpful.

CANADIAN NEUROLOGICAL HOSPITAL SEPTEMBER, 1939, TO DECEMBER, 1940

In the autumn of 1939 groups of leading Canadian neurologists, psychiatrists and neurosurgeons met with the military representatives in Ottawa, Montreal and Toronto to discuss planning for treatment and evacuation of neuropsychiatric and neurosurgical casualties in Canada's new army.

From the mass of experience of the Allied Armies in the first Great War, the costly pension experience in England, Canada and the U.S.A. after that war, and from what we could

learn from the Spanish Civil War, it was almost unanimously decided that both neuropsychiatric and neurosurgical treatment should be instituted earlier and much farther forward in the battle zone, and that evacuation of the psychoneurotics should be restricted, if not prohibited.

There was considerable disagreement as to the organization required, and discussion of the various suggestions would serve no purpose in this survey. Suffice it to say that out of these discussions authority for the Neurological Hospital, R.C.A.M.C., was granted, and the hospital was mobilized in January, 1940.

This unit of 200 beds, in numbers of personnel and location was to resemble a C.C.S., but there the similarity ended. It was to be much more technical in both personnel and equipment, and, above all, it was to be more mobile. The unit itself was to be moved by R.C.A.S.C., but its neurosurgical teams, with light operating equipment, portable x-ray, etc., were to be brought to emergency cases in vehicles attached to the hospital as in war establishment.

There was a considerable time-lag before this unit functioned. The primary cause for the delay was due to the fact that there was no precedent in its war establishment, and many of the items of its A.F.I. 1248 had to be specially bought or manufactured. The secondary cause lay in the change of plan of campaign following the fall of France. Although the unit, less its nursing sisters, arrived in England in June, 1940, it did not receive patients until September of that year. Because of the difficulty in adapting a large country house to the needs of a hospital, and the time required to build huts to accommodate the other rank personnel of the Unit, it was not till the winter of 1940-41 that No. 1 Neurological Hospital became capable of receiving all of the neuropsychiatric and neurosurgical patients of the C.A.(O).

NEUROPSYCHIATRY IN C.A.(O) DECEMBER, 1939, TO SEPTEMBER, 1940

Because the Canadian Neurological Hospital had been authorized, and was expected to follow the Canadian Expeditionary Force almost immediately, to it were posted the neuropsychiatrists and neurosurgeons already in the Army, or who contemplated joining it at that time, and no alternative organization was set

up. The Canadian General Hospitals had on their strength medical specialists well trained in neurology and surgeons well qualified to do emergency neurosurgery; but the only officers in the C.A.(O) during the winter and spring of 1940 with psychiatric training were a few M.O.'s who had come overseas in other capacities, and with no intention to practise their specialty for the duration. As I was the senior of these, I was asked by the Director of Medical Services in February, 1940, to examine and recommend disposal of the cases of psychosis and psychoneurosis which were accumulating in British hospitals.

No Canadian hospital opened in England until after the fall of France. This was not due to faulty planning, but because one Canadian General Hospital was standing by closed so that it could proceed to France with the 1st Canadian Division, and another Canadian General Hospital was waiting completion of its buildings. During this period the Canadian sick were very unhappy in British hospitals. The R.A.M.C. officers and nurses were very co-operative and sympathetic but they had troubles of their own.

The winter of 1939-1940 was bitterly cold and at one time there was a local coal shortage. Two R.A.M.C. hospitals were very busy because of the expanding needs of the British Army, and were short-staffed because any surplus of physicians and surgeons was being absorbed by the emergency medical service. This situation was particularly trying to the French Canadian soldier, and I have seen nothing more isolated than a non-English-speaking French Canadian soldier confined in a British Isolation Ward with German measles! Although not acutely ill physically, he was confined because of his infection; he could not talk to any one and could not read the English newspapers.

At the end of February, 1940, there were more French Canadians confined in the psychopathic ward of one hospital than British and Canadian English-speaking patients combined.

Brigadier E. A. Bennet, R.A.M.C. psychiatrist, was very helpful in the sorting and disposal of these cases. All of the psychotics, and the worst of the psychoneurotics, were medically boarded, and were retained at a military mental hospital pending return to Canada. The mild and convalescent psychoneurotics

were either sent to one of the British emergency hospitals, to a Canadian convalescent depot, or were returned to duty. By May the situation had greatly improved, partly because of improved disposal facilities, and partly because of improved weather, spring training and the prospect of going abroad.

At the end of June an outpatient consulting service was set up at another Canadian General Hospital, and in July a special psychiatric ward was opened. Both of these carried on until May, 1941, but were of decreasing importance after January, 1941, as the Neurological Hospital expanded.

Policy in disposal was changed three times during 1940. On my peace time and first Great War experience, I felt that very few neurotics should be allowed to return to Canada on medical grounds. Even after it was obvious that, in most cases, two months' treatment at Mill Hill resulted in only temporary improvement, and recurrence of symptoms would be expected after a period of full duty, I still thought that if only we had Canadian hospitals a high percentage could be rehabilitated. When we did get our own hospitals, it was found that the salvage of effective personnel was only slightly improved.

The period from May to September, 1940, was a troubled time in England. After the fall of France, it was decided that many of the psychoneurotics of the type retained in England a few months before, would not stand the stress of invasion, would be an encumbrance, and, therefore, should be evacuated to Canada. There was no difficulty in doing this as I was at that time the neuropsychiatric specialist and the president of the standing medical board!

At this time, the new Holding Units, set up in May, were becoming a dumping ground. When the field units (which up to now had been carrying their first reinforcements) went to France they dumped their most useless men on the Holding Units. The problems of these units were increased by the hospital discharges. First, some men were sent to hospital with slight respiratory infections for the sole purpose of getting rid of them. Some admission slips had on them "Please discharge this man to the Holding Unit as he is no use to us". Secondly, it was decided to retain category 'C' men in England on base duty. Obviously, there are few jobs in a Holding Unit which

can be filled by C2 men who are mentally unstable, particularly at a time when these units were being bombed, and an enemy invasion was thought to be imminent.

It was during the ensuing house clearing period that the Neurological Hospital began to operate, and again an attempt was made to rehabilitate a greater proportion of the psychoneurotics.

JANUARY, 1941, TO JULY, 1942

Early in 1941, a committee was appointed to advise the D.M.S. in regard to functional nervous disease in the C.A.(O). Colonel C. K. Russel, who later became the first neuropsychiatric consultant, was the senior member of this committee and his wide experience in both civil and military neuropsychiatry was of great value in keeping the discussions on a practical basis.

Although at this time there was lack of uniformity in terminology used in diagnosis, and in categorization and disposal of all types of cases by medical boards, the disparity was most obvious in patients complaining of symptoms referable to the nervous, gastro-intestinal, and cardiovascular systems. We had avoided the term "shell shock" but were still using such terms as functional dyspepsia, gastric neurosis, disordered action of the heart and effort syndrome without defining the terms used. As a result of this, many patients whose primary disability was anxiety neurosis (superimposed in a constitutionally unstable or inadequate individual) were treated for their symptoms only, and after medical board and disposal were shown as casualties with disease of the gastro-intestinal or cardiovascular system, or as "no appreciable disease". For example, a psychoneurotic whose predominant symptoms were gastro-intestinal, and whose gastro-intestinal series was negative for peptic ulcer, would, if he appeared before an M.O. of the "treat 'em rough" school, be returned to duty as "no appreciable disease", or, in gentler hands, be medically boarded with a diagnosis of functional dyspepsia, or might finally be admitted to hospital for prolonged observation and investigation which tended to foster his idea of disability.

Therefore, the committee on functional nervous disease, after discussion with the cardiologists and gastro-enterologists recommended that: (a) All patients whose symptoms were primarily psychogenic be classified under the appropriate neuropsychiatric diagnosis, and that

qualifying terms, such as "with gastric symptoms", might be added in brackets. (b) All cases of psychoneurosis in which the question of invaliding out of the Army arose, be transferred to the Neurological Hospital for investigation and treatment, or for advice regarding disposal.

The adoption of these recommendations resulted in the centralization of neuropsychiatry at the Canadian Neurological Hospital. This policy was satisfactory from the standpoint of investigation, treatment and medical boarding, but as the Canadian Corps expanded it became inadequate as far as field units were concerned. Because of the time and transport required to obtain a specialist's opinion in cases which did not require hospital admission, many cases were not referred at all, or were only referred to the neuropsychiatric specialist when the disease was so advanced that the soldier was useless to his unit. Since rehabilitation of the psychoneurotic is difficult at any time, and becomes more difficult in cases of long standing, it became apparent that the needs of the C.A.(O) could not be satisfied by one or two centrally placed groups of specialists.

The Canadian Neurological Hospital was planned and mobilized to operate "behind the Maginot Line". With the changed picture of modern warfare, *i.e.*, fighting in depth and the difficulty of lateral evacuation, it became apparent that this unit would probably never carry out the functions for which it was mobilized. Not only would it be useless in a forward area, but because of its heavy x-ray and other technical equipment, its mentally unstable patients on the medical division, and severe head and spinal injuries on the surgical, it would be a detriment.

In view of the above considerations and the obvious need for alteration in policy, a meeting of neurosurgeons and neuropsychiatrists was held at the Canadian Neurological Hospital early in May, 1942, and the following recommendations were submitted to the D.M.S.: (a) That the Canadian Neurological Hospital become a special base hospital for the investigation and treatment of all types of neurosurgical, neurological and psychiatric cases requiring hospitalization. (b) That the need of field units for advice, and a consulting service close at hand, be met by the appointment of additional neuropsychiatrists on an area or formation basis. It was felt that this organization would be practical while the C.A.(O) remained static in

England, and would require little modification when the army went abroad.

Meanwhile the personnel selection board had, during the winter of 1941-1942, carried out psychometric tests and interviews on a cross section of the Canadian Army, and from their preliminary survey in the spring of 1942, it was estimated that 5% of all soldiers required psychiatric examination.* Since it was obviously impractical to transport several thousand additional patients to the Canadian Neurological Hospital, this brought the whole question of area or regional psychiatrists to a head. In July, 1942, local authority was obtained from the Senior Officer, C.M.H.Q. to appoint regional neuropsychiatrists on the basis of one per Division, and additional ones for Base unit areas (including detention camps and prisons), and one for the Canadian Forestry Corps.

REGIONAL NEUROPSYCHIATRISTS

Although authorized on a basis of one per division, it is not intended that the regional neuropsychiatrists be divisional troops. They will form a pool of specialists who may be attached to any medical unit, from Field Ambulance to Base Hospital, as the situation demands. The term Regional Neuropsychiatrists was suggested to differentiate them from the British area psychiatrists who function in clearly defined military areas in Great Britain.

In the selection of suitable Officers for field work, the following criteria were laid down: (a) Preferably Category A and certainly not lower than B1. (b) Not more than forty years of age. (c) At least five years' experience in psychiatry. (d) Army experience in a field unit, preferably as regimental medical officer. (e) At least two months at the Canadian Neurological Hospital for instruction in neurology and army neuropsychiatry.

In considering the above standard, all the old arguments were raised as to whether psychiatry and neurology should be separated in the R.C.A.M.C. It is admitted that there are sound arguments for and against. The R.A.M.C. separates the two specialties. The R.N. Medical Service combines them. Both systems work.

The decision that the regional neuropsychiatrists should have more than a smattering of neurology was made because the work in the C.A.(O) is not comparable to civilian psychiatric practice or to the examining of recruits at the point of intake. The field worker must be capable of differentiating between organic

* The psychiatrists of the British Army estimate that 8 to 10% of the whole army intake require special consideration with respect to their allocation because of psychiatric disabilities.

and functional nervous disease without referring to another specialist and without carrying out elaborate tests. He must differentiate between early disseminated sclerosis and hysteria or malingering; between hysterical fits and epilepsy. He must be able to estimate the disability present in a patient who has disease of the central or peripheral nervous system, and who is exaggerating his disability.

Recent advances in physiology and pathology, in electroencephalography and electric shock therapy, all indicate that the old division of nervous disease into organic and functional airtight compartments is purely artificial. The original decision made in 1939 to combine neurology and psychiatry in one group of specialists was therefore confirmed at this time.

Seven regional neuropsychiatrists have been selected. Five have had wide experience in psychiatry and army problems in England; two, of equally good type, were sent from Canada in August, 1942. Although only four of these are at present employed in field work, the others can be made available when the Canadian Army goes abroad.

I am very proud of these officers and the work they are doing. It is too early to estimate their value to the Canadian Army, but already several hundred cases have been disposed of which would otherwise have been admitted to hospital, and many more mild cases of psychoneurosis have been examined than would have been possible under the old organization. As a result of this, there are fewer patients in the Neurological Hospital than a year ago, although there are many more Canadian troops in England. The out-patient work of that hospital has correspondingly been reduced.

In order that the regional neuropsychiatrists would not be hampered by preconceived ideas based on the last war, they have been given a minimum of direction by me. In addition to the large out-patient clinics conducted at the units to which they are attached, they are encouraged to visit the units in their areas and find out what the problems are. In the monthly reports submitted to me, they are encouraged to make any suggestion or recommendation they wish on any neuropsychiatric problem. Many useful suggestions have been made, and lines of investigation started (such as psychopathic personality and its relation to army crime), which are outside the scope of this paper.

CLINICAL AND ACADEMIC WORK

The Neurological Hospital is excellently staffed and equipped. With its expansion to 600 beds (which is almost complete), its medical division will have a reserve of beds which, in my opinion, will be adequate for the present C.A.(O) for the duration of the war. The investigation and treatment is comparable to that in the best British hospitals. Although much of the work in functional nervous disease is now done by the regional neuropsychiatrist, practically all neurological cases are transferred there, and this will continue to be the policy. Patients requiring electroencephalograms are referred to Squadron-Leader Dennis Williams, St. Hugh's College Hospital, Oxford.

Clinical meetings are held each Wednesday afternoon, at which the most interesting and the most contentious cases are presented. Medical officers from the neighbouring hospitals and Canadian units are invited to attend. At a recent meeting we were fortunate in having as guest speaker, Major H. B. Craigie, R.A.M.C., who had spent over two years in psychiatry in the Middle East.

The regular monthly hospital meetings, which are held in rotation at all Canadian Hospitals, were at the Neurological in May and November, 1942. At these meetings, the morning sessions were entirely clinical, and in the afternoon the guest speakers were officers who had had wide experience in the Middle East theatre of war. Lectures have been given by specialists on the staff of the Neurological Hospital, and by the consultant neuropsychiatrist, before Divisional medical groups and to the medical officers of the Canadian General Reinforcement Unit.

Short study courses in neurology and psychiatry have been made available to R.C.A.M.C. Officers at several British hospitals. To date relatively few officers have been able to take advantage of these.

The regional neuropsychiatrists have met with the consultant and the medical division of the Neurological Hospital to discuss general policy and problems arising out of field work. Because of the lack of precise meaning of many of the psychiatric terms in common use, a committee has been appointed to review the whole question of terminology. The recommendations of this committee have been approved and a new nomenclature issued. This nomen-

clature has been accepted by the psychiatrists in the Canadian Army in Canada, thus ensuring a consistency of terminology and recording.

Although there have been few cases of acute war neurosis in the C.A.(O), some of us who were in England at the time of the Dunkirk evacuation, and during the severe blitz period, July, 1940, to May, 1941, did see cases of "acute anxiety state", "panic reaction", "fuges" and "exhaustion" in both civil and military personnel, associated with fatigue, exposure, bereavement and fear of enemy action. We are quite familiar with the therapy as practised in the British (E.M.S.) psychiatric hospitals,—prolonged sedation, sub-convulsive insulin therapy and psychotherapy.

The immediate psychiatric casualties following the Dieppe raid were as expected. Because of the brevity of the action, there were only a handful, and they were admitted to hospital with such diagnoses as exhaustion, immersion and concussion, with or without objective evidence of trauma. In the four months following Dieppe, as was also expected, other cases have been referred for psychiatric examination, in which the alleged precipitating cause of psychoneurosis was the Dieppe action. In nearly all of these cases the constitutional predisposition to neurotic breakdown is obvious. It is expected that further similar cases will arise during the war, and that pension application will be made on this basis by soldiers who were not even at Dieppe.

[To be continued]

OTITIC AND SINUS BAROTRAUMA*

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[T has been thought for some time that similar changes occur in the middle ear cleft and in the paranasal sinuses when there is obstruction to the free ingress and egress of air during variations in barometric pressure. In the United States two terms were given to these conditions, "aero-otitis media" for the aural syndrome¹ and "aerosinusitis" for the dis-

turbances in the sinuses.² Prior to this the terms "aviator's" or "aviation ear" had begun to appear in the American literature while in Germany the terms "barotrauma" and "tone-trauma" had been suggested. In Great Britain the syndrome of aero-otitis media was called "aviation pressure deafness".³ The Royal Air Force decided to simplify this nomenclature by designating the changes in the ears and sinuses as barotrauma and specifying location by the words otitic or sinus. Thus otitic barotrauma corresponds to the terms aero-otitis media, aviator's ear or aviation pressure deafness; while sinus barotrauma is the same as aerosinusitis. The Royal Canadian Air Force has adopted this terminology so that there will be conformity in the two services.

It has been our privilege to have seen a number of cases of otitic and sinus barotrauma in aircrew trainees and flying personnel. The use of a low pressure chamber has been a great help in the diagnosis and treatment of these conditions, as controlled observations can be carried out at different altitudes more readily than in an aircraft.

OTITIC BAROTRAUMA

Since the Eustachian tube plays the most important rôle in the production of deleterious effects on the ear during altitude changes, a brief review of its anatomy and physiology will be presented.

The Eustachian tube is a slitlike, potential tube extending from the middle ear to the nasopharynx. The wall of the lateral one-third is a bony canal and that of the medial two-thirds is formed by a triangular cartilaginous plate, hook-shaped in cross section. The apex of the plate is attached to the bony portion of the tube, while the base of the plate projects under the mucous membrane of the nasopharynx to form a prominence, the torus tubarius, bounding the Eustachian orifice posteriorly. The Eustachian tube is narrowest at the junction of its osseous and cartilaginous portions.

The lining mucosa of the lateral one-third is thin, while that of the medial two-thirds of the tube is thick and vascular, lined with ciliated columnar epithelium, and contains numerous mucous glands. The mucous membrane of the Eustachian tube is a direct extension of that of the nasopharynx and continues backward to line the middle ear completely. A variable amount of adenoid tissue is found near the orifice of the Eustachian tube. In its resting state the walls of the cartilaginous portion are in apposition, so that the tube is only potentially patent.

The mechanism for opening the tube lies in the tensor veli palatini and the salpingopharyngeus muscles, which are attached to the fibrous wall of the tube above and the palate and pharyngeal wall below. In a normal tube, voluntary contraction of these muscles by yawning, swallowing or merely tensing the pharyngeal and palatal muscles retracts the fibrous lamina and places the middle ear cavity in direct communication with the nasopharynx. The Eustachian tube drains and ventilates the middle

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ear. The motion of material from the ear to the nasopharynx is favoured by the ciliary action and the valve-like nature of the tube.

During ascent there is a reduction in atmospheric pressure, and gas in a closed cavity tends to expand. For example, a toy balloon inflated with air at ground level will have expanded to approximately twice its former size when an altitude of 18,000 feet has been reached. As the middle ear is an air-containing cavity this expanding air must escape on ascent or there is a bulging outward of the tympanic membrane. Air escapes in puffs through the Eustachian tube at intervals of 425 to 500 feet depending on the altitude. It is characterized by a "clicking" sound due to the tympanic membrane snapping back to, or almost to, normal position, and the feeling of fullness in the ears disappears.

On descent a different situation exists. Due to the valve-like action of the Eustachian tube, air can escape passively from the middle ear on ascent, whereas on descent a voluntary effort must be made to open the tube. If a subject neglects to ventilate his middle ear by contraction of the muscles surrounding his Eustachian tube, a pressure difference builds up between the middle ear and the atmosphere. If this negative pressure in the middle ear cavity becomes close to or greater than 100 mm. of mercury (descent of 4,000 to 10,000 feet depending on the altitude), the muscles are unable to overcome it. It is necessary to ascend again to higher altitudes to "unlock" the Eustachian tube.

ETIOLOGY

Otitic barotrauma develops when there is inadequate ventilation of the middle ear during changes of atmospheric pressure. In the absence of ear, nose or throat pathology, the Eustachian tube may fail in permitting adequate pressure equalization under the following circumstances: (1) very rapid descents under operational conditions when the attention of the airman is focussed upon the action of the moment; (2) faulty understanding of the methods of insufflation on the part of the airman; (3) during sleep or coma in passenger or ambulance transport.

Various pathological conditions have been described as causes of Eustachian stenosis. These have included acute and chronic infections of the upper respiratory tract, nasal obstructions, sinusitis, tonsillitis, tumours and growths of the nose and nasopharynx, paralysis of the soft palate or superior pharyngeal muscles, enlargement of the pharyngeal or tubal tonsil, inflammatory conditions of the Eustachian tube following adenoidectomy, and malposition of the jaws.

Personal experience has been that the commonest cause of temporary obstruction is an acute upper respiratory infection, especially if there is considerable residual adenoid tissue in the nasopharynx. During acute infections this tissue becomes much larger and may cause temporary obstruction. There is an associated swelling of the lining mucosa of the Eustachian tube as well.

SYMPTOMATOLOGY

The symptoms of otitic barotrauma are deafness, pain, feeling of fullness in the ears, and occasionally tinnitus and vertigo. In the original description of this syndrome Armstrong and Heim¹ stated that the deafness is of a conduction type. While it is the commonest type of deafness encountered in patients with this lesion, McGibbon,³ Simpson,⁴ and others have had cases in which there was a high tone loss. These losses are temporary, lasting from a few hours up to a couple of weeks, but a few cases have been recorded where there was a permanent "inner ear" type of deafness. This temporary loss of high tones may be explained by Loch's⁵ experiment in which he caused occlusion of the Eustachian tube in man by inflating a balloon in the nasopharynx. This produced first and mostly a hearing impairment in the high tone region followed later by a slight impairment of middle and low tones. Immediately after restoration of adequate ventilation of the middle ear the hearing threshold for all frequencies returned to the values obtained before the experiment. This phenomenon may be one explanation of the variation in audiograms shown by different subjects who have experienced otitic barotrauma. The decrease in auditory acuity is obviously the result of interference with the conducting mechanism in the middle ear. The tense tympanum and change in angulation of the ossicles reduce the amplitude of vibration at the oval window. Air conduction is decreased and in unilateral otitic barotrauma Weber's test is usually to the affected side.

Pain may vary from a mild feeling of fullness in the ear to a very severe type depending upon the degree of negative pressure which created the condition and upon the pain threshold of the individual. The pain is referred typically to the parotid area or an area posterior to the angle of the mandible. It is commonly thought to be due to alterations in the tension of the tympanic membrane. However, stimulation of pain endings in the lining mucosa of the middle ear cavity is probably a more important factor. The character of the pain is very similar to that produced by negative pressure in the frontal sinus in which a bony and mucosal wall only is involved.

The otoscopic appearance of the tympanic membrane depends upon the extent of the pressure changes to which it has been subjected. It may vary from a mild injection of

the vessels along the handle of the malleus, or of the vessels in the attic, to a generalized injection of the whole membrane. In severe cases this is followed by effusion of serum and occasionally there is a hæmorrhage into the middle ear. If the lesion has been produced during rapid descent the tympanic membrane is invaginated and may be firmly pressed against the medial wall of the middle ear in such a fashion that the ossicles stand out in bold relief. When there is an effusion of fluid, it can be seen through the tympanic membrane usually. Those with a hæmorrhage into the middle ear have a generalized red injection followed later by a bluish red tint. This type is slow in subsiding. To indicate apparent extent of trauma the following classification has been found useful: 1st degree, partial injection of the ear drum, along the handle of the malleus and in the attic; 2nd degree, generalized injection of the ear drum; 3rd degree, generalized injection with detectable formation of fluid in the middle ear; 4th degree, hæmorrhage into the middle ear. In this group is included the rare complication of traumatic perforation.

The signs and symptoms may last from a few hours to two weeks depending upon their severity. Cases of moderate severity subside both subjectively and objectively in 48 to 72 hours. One case reported by McGibbon³ required fourteen weeks to resolve. He called this condition secondary vital occlusion of the Eustachian tube and surmized that it was due to secondary biological changes occurring after the initial mechanical occlusion.

PREVENTION AND TREATMENT

Since the primary cause of otitis barotrauma is obstruction of the Eustachian tube the best prophylaxis is to ascertain whether this structure is patent in people who are contemplating flight, and to instruct them in the methods of ventilating the middle ear. Tubal patency can be tested by observing the tympanic membrane with an otoscope or by auscultation with a Toynbee tube. The latter method has proved quite satisfactory in our hands, as entrance of air into the middle ear can be heard in many cases where no movement of the tympanic membrane can be detected. The patency of these tubes was confirmed subsequently by free ventilation in the low pressure chamber. Tubal patency can be graded according to the method required to get air entry. A freely patent tube

opens on the normal act of swallowing, one with a mild stenosis on swallowing with the mouth and nostrils held closed, while one with considerable stenosis requires Valsalva's inflation to open it. When these methods fail a temporarily obstructed tube can frequently be opened by a Politzer or Eustachian catheter inflation.

Individuals with temporary or permanent obstruction of the Eustachian tube should not fly until this abnormality is corrected. The temporary group includes acute upper respiratory infections, especially if there is an acute nasopharyngitis. Although individuals with an ordinary head cold may have difficulty, our experience has been that those who develop the most severe otitic barotrauma have an associated acute nasopharyngitis. In the presence of a head cold, the danger of developing otitic barotrauma seems to be greatest during the first three or four days. These observations have been made after examination of many hundreds of aircrew trainees who had routine runs in the low pressure chamber ascending to altitudes of over 25,000 feet.

Active treatment is directed at restoring ventilation of the middle ear and encouraging drainage of any fluid that may have formed. This is accomplished by the application of shrinkage agents on the nasal mucosa and over the Eustachian orifices. A solution of 1/2% cocaine followed by 1% ephedrin or 1/2% neosynephrine has been found efficacious. Inflation by the gentle use of a Politzer bag or preferably a Eustachian catheter is recommended if done within the first two hours. After that time it is difficult to get air into some tubes that have not had forced ventilation. To date there is no definite evidence that these procedures have carried up infection from the nasopharynx. Instead, it seems that the establishing of ventilation apparently encourages the cilia of the Eustachian tube to drain the middle ear into the nasopharynx. A nasopharyngoscope is most useful in observing the regions of the Eustachian orifices.

Analgesics may be necessary to relieve the pain during the first twenty-four hours. Hot saline gargles are recommended. The application of external dry heat is appreciated. Warm refined glycerine instilled into the canal often gives some relief. Keith's dressing or other glycerine drops containing phenol should not be used as they cause destruction of the epi-

thelium and complicate the picture. Some like a plug of cotton in the external canal during cold weather.

Paracentesis of the tympanic membrane is contraindicated. This procedure carries infection into a cavity that may be sterile otherwise. In order for otitic barotrauma to subside there should be a reversal of the process that caused it, *i.e.*, by way of the Eustachian tube rather than by external drainage through the tympanic membrane. If there has been hæmorrhage or profuse outpouring of serum into the tympanic cavity, inflation by a catheter when the process is subsiding will help prevent progressive deafness. Ruptures of the tympanic membrane should have nothing instilled into the external canal and be treated expectantly.

If there have been repeated attacks of otitic barotrauma the cause of the Eustachian obstruction should be looked for and if possible corrected. Excessive lymphoid tissue in the nasopharynx and marked nasal obstruction are two of the worst offenders, but possible causes in the sinuses, nose, pharynx and ear should be eliminated. Radiation therapy by someone skilled in the procedure appears to bear promise as a means of preventing recurrences of otitic barotrauma in individuals who have excessive lymphoid tissue in the nasopharynx.* If there is malposition of the jaw, compression of the Eustachian tube may take place. If suspected it is advisable to have a dentist temporarily reposition the jaw by the technique of Willhelmy.⁶

SINUS BAROTRAUMA

In the Royal Canadian Air Force sinus barotrauma has not occurred with the same frequency as otitic barotrauma. However, when it does develop it is quite severe occasionally and may result in an airman ceasing training if measures are not taken to prevent its recurrence.

As previously stated a somewhat similar chain of events occurs in the sinuses and ears during changes in atmospheric pressure. The paranasal sinuses are air-containing cavities opening by one or more ostia into the nasal fossæ and nasopharynx. They have rigid bony walls lined by a columnar ciliated epithelium which is a direct extension of that lining the nasal cavities. The mucous membrane contains many mucous glands. The elastic fibrous connective tissue

supporting the membrane is rich in elastic blood vessels. If these anatomical features are kept in mind along with the fact that the contents of a rigid cavity flow out on ascent and in during descent, a relatively simple explanation of the production of sinus barotrauma can be offered.

If there is redundant tissue or a polyp in the region of a sinus ostium there may be an obstruction to ventilation of the cavity. If the obstruction occurs on ascent, a relative positive pressure builds up inside the sinus, while an obstruction acting during descent develops a partial vacuum. Fluid lying over a dependent sinus ostium will be forced out on ascent while nasal discharge over an ostium may be aspirated into the sinus during descent.

Although symptoms of sinus barotrauma do develop on ascent, they occur more frequently during decrease of altitude because rates of descent are usually greater and the ball-valve action of an obstructing agent is more effective when air is seeking entrance into a sinus. Observations in the low pressure chamber indicate that sinus barotrauma develops most frequently during descent from an altitude of 25,000 feet or over, necessitating levelling off around 18,000 feet.

The pain usually starts in the frontal region, spreads up towards the vertex, radiates between and behind the eyes, and sometimes into the maxillæ. Frequently there is excessive lacrimation from the eye on the side most involved.

Examination of the nose during an episode of sinus barotrauma may show no evidence of any changes in the mucosa. Later there may be a discharge of black blood or serous fluid issuing from the superior or middle meatus. One case which came under personal observation had a discharge of black blood into the middle meatus eight days after the initial episode of sinus barotrauma. There was an associated haziness of the left frontal sinus on transillumination and x-ray. This took over one month to clear.

Treatment is directed at relief of pain and nasal shrinkage. The cause of the obstruction should be ascertained and if possible corrected surgically. This may necessitate a submucous resection, nasal polypectomy or opening some of the ethmoid cells. Cases developing sinus barotrauma warrant careful investigation by an otolaryngologist. Preventive measures include avoidance of flying during head colds,

* Since this paper was presented, a series of such cases have been under observation here.

episodes of allergic rhinitis or active sinusitis. Marked septal deflections and nasal polypi may sometimes be present and no sinus barotrauma develop. However, it is our opinion that such conditions should be corrected especially if there is a septal spur which is in contact with the inferior or middle turbinates.

SUMMARY

The conditions otitis barotrauma and sinus barotrauma have been discussed to show the similarity in the method of their production. An attempt has been made to describe the current ideas on their etiology, symptomatology and methods of prevention and treatment. The terms otitic and sinus barotrauma have been adopted by the Royal Air Force and Royal Canadian Air Force to eliminate a multiplicity of names such as aero-otitis media, aviation pressure deafness, aviator's ear, aerosinusitis and vacuum headache due to altitude changes.

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RÉSUMÉ

Le barotraumatisme otitique et le barotraumatisme sinusien se produisent dans des conditions identiques. Le barotraumatisme otitique se produit au cours des vols rapides en piqué, lorsque l'aviateur néglige de prendre les précautions usuelles de ventilation de l'oreille moyenne, et lors du transport aérien de malades inconscients. Les infections locales sont des agents prédisposants. Les symptômes habituels sont la surdité, la douleur, le vertige et les bourdonnements, tous de durée variable mais généralement peu prolongés. La prévention la meilleure consistera à assurer la perméabilité de la trompe d'Eustache, et le traitement visera à rétablir, puis à maintenir cette perméabilité. Le barotraumatisme sinusien est moins fréquent. Il survient lorsque les ouvertures des sinus s'obstruent et est plus fréquent durant les descentes d'altitude élevée. La douleur, d'abord frontale irradie au crâne et à la face. Le traitement est souvent chirurgical: polypectomie, sous-muqueuse, etc. Il faudra éviter de voler au cours d'un coryza ou d'une sinusite aiguë. La terminologie présente est adoptée par la R.A.F. et par le R.C.A.F.

JEAN SAUCIER

BRONCHOSCOPY IN THE MANAGEMENT OF MASSIVE PULMONARY COLLAPSE*

By Major G. A. Henry, R.C.A.M.C.

[FEEL definitely that bronchoscopists have something worth while to offer in the treatment of atelectasis.

During the past year at St. Michael's Hospital the Bronchoscopic Department had the opportunity of assisting in the treatment of thirty-two such cases. Twenty-two of these were of the postoperative variety.

Atelectasis was named by Jorg in 1834. The onset of atelectasis is due primarily to mechanical obstruction to the normal airway or of a lobe of a lung, with decreased bronchial drainage. This obstruction is caused frequently by thick tenacious secretions which accumulate in the bronchi. It follows, of course, that any other cause which could effect an obstruction of a bronchus from within or by pressure from without would produce the same result. These thick secretions behave like a foreign body. There may be an actual emphysema at first on the involved side, but, once the lumen becomes occluded so that no new air can enter, the re-absorption of trapped air occurs and atelectasis and mediastinal shift follow. With the removal of the obstruction air again passes into the lung, with gradual re-expansion and drainage of secretions.

Some workers report a vasomotor reflex via the vagus which directly affects the lungs, and feel that this is the important causative factor. Bronchial obstruction assisted by posture and tenacious secretions lateralize the lesion. Compensatory emphysema tends to keep the opposite lung area free but, should this fail, bilateral obstruction may occur. Occasional cases of collapse have been reported apparently without cough, expectoration or secretion in the bronchi.

Atelectasis is a common, postoperative lung complication and abdominal operations head the list. Some place the figure as high as 10% for all abdominal operations and up to 30% for operations in the epigastrium. Be that as it may, it occurs all too frequently and is a major worry following abdominal surgery. It has long been recognized that atelectasis may occur without operative interference and its assisting

* Presented to the Section of Medicine, Academy of Medicine, January 12, 1943.

causes. Several of the cases in this series are of this type.

Among the important means of prevention may be listed: Elective surgery should be done at a time when the patient is free from colds. Bad oral sepsis should first be corrected. Prolonged anaesthesia, or too much postoperative sedation, should be avoided if at all possible. These conditions favour the accumulation and stagnation of secretions. Patients suffering from bronchiectasis or chronic bronchitis should be particularly watched after operation for signs of early atelectasis. Before pneumonectomy patients with bronchiectasis should be aspirated either on the operating table or shortly before operation. Intratracheal anaesthesia will probably help prevent aspiration of secretions if the patient is in the head-low position. If the patient's head is horizontal or higher than the chest, there is a tendency to drain the secretions into the bronchial tree. If a Miller-Abbott duodenal or similar tube is left in the oesophagus the patient's head and chest should be raised so that secretions do not re-enter the pharynx through the partly-opened cricopharyngeus to be aspirated into the trachea. After operations under anaesthesia on the nose and throat the patient should be placed in such a position that blood and other secretions will readily escape from the mouth. Tight abdominal binders interfere with the breathing, particularly if they infringe on the thoracic cage, thus restricting breathing in these areas of the chest. In the light of recent work done, any patient showing signs of stasis of secretion in the lungs should rebreathe 5% carbon dioxide, and 95% oxygen every four hours or oftener, to stimulate hyperventilation. Steam inhalation should be given to help liquefy the secretions. A room temperature of 70 to 75 degrees with a high relative humidity is suggested as best. Naturally, coughing should be encouraged to remove the troublesome secretions.

Should these measures fail to improve a minimal atelectasis, or should the collapse be clear-cut, or the patient very ill, bronchoscopic aspiration should not be delayed.

The site of the operation has a bearing. It is noted most frequently following upper abdominal operations; about twice as frequently following gastric as biliary operations. It occurs most often in patients with a chronic cough. That males suffer nearly twice as often as females is explained by the fact that they mainly

use the diaphragm, while females make greater use of the intercostal muscles. Following upper abdominal operations diaphragmatic breathing is likely to be interfered with to a great extent.

In studying this series, it is my intention to pick out a few representative cases. On the remainder I shall make only a few observations. Bronchoscopic aspiration was carried out under local anaesthesia in all but two patients. In those two, sodium pentothal was used intravenously. My own procedure has been to use a small dosage of nembutal as a preoperative sedative with a 5% cocaine spray as the local anaesthetic. Feeling that the cough reflex both during and after the aspiration was a most important asset to a successful result, opiates of any kind were avoided. Likewise, atropine which would retard and thicken the secretions was avoided. With good co-operation from the assistants and a proper cocainization of the mouth and larynx aspiration is done in a few minutes with a minimum of disturbance to the patient. Indeed, the gravely ill were usually less apprehensive and experienced little difficulty with the procedure.

CASE 1

H.G.W., a middle-aged man, was operated upon for a penetrating gastric ulcer. Thirty-six hours later he was acutely ill. He was so short of breath that he had to be put in an oxygen tent. His chart showed a temperature of 100.5° F., pulse 110, respiration 30. There was considerable shift of his trachea to the right. Movement of the whole right chest was markedly decreased. Breath sounds were distant over the right chest and absent over the right lower lobe which was dull to percussion. Scattered râles and ronchi were present over both sides of the chest. X-ray confirmed these findings of atelectasis and mediastinal shift. At bronchoscopy several ounces of greenish bile-like material were removed from the right main bronchus. At the opening of the right lower lobe bronchus a mucous plug was removed. The patient came on the table gasping for breath and went back to his room much improved. The next morning he was found reading the paper with a normal temperature, pulse and respiration. There is an interesting and perhaps pertinent point. This man had a Miller-Abbott tube inserted. During the bronchoscopic aspiration, while his head was down low, he gagged and some greenish material similar to that aspirated escaped from the oesophagus into the pharynx. This might easily have happened while the patient was lying asleep in a horizontal position and have been aspirated.

CASE 2

E.B., aged 39, had a cholecystectomy under spinal anaesthesia and cyclopropane. Thirty hours later she was acutely ill and quite cyanosed with her temperature 103°, pulse 140, and respirations 36. Her trachea was abruptly shifted to the right. The right upper chest was dull to percussion with diminished breath sounds. X-ray showed opacity with partial collapse of the right upper lobe.

At bronchoscopy the carina was found to be so far shifted to the right that only the smallest suction tube would enter the right main bronchus. With the

removal of two to three ounces of thick mucoid secretion, the right main bronchus gradually opened to the point where a 7 mm. bronchoscope could be inserted. There was considerable oedema in the region of the right upper bronchus. Adrenalin was applied and suction directed to the lobe opening. The remainder of the right bronchial tree was inflamed and swollen, but to a lesser degree. An x-ray taken twelve hours later showed the return of the pulmonary picture nearly to normal. There was an accompanying improvement of temperature, pulse and respiration.

CASE 3

E.P., a teen-age girl, had her left lower lobe removed for bronchiectasis. The following day she was found to have atelectasis of her right lower lobe. She was bronchoscoped the same day by Dr. S. L. Alexander, who removed from two to three ounces of pus from her right main bronchus. The mucous membrane was found to be much inflamed. The patient generally was considerably improved, but the x-ray showed some remaining collapse. Five days later, when she was again bronchoscoped, a smaller amount of mucoid pus was obtained from the right main bronchus and a little from the left. The mucous membrane in the right main bronchus was not nearly so oedematous. A later x-ray showed further improvement with a slight persisting collapse.

CASE 4

J.Y.H., aged 19, was admitted to the Obstetrical Ward shortly after a big meal. During the anaesthesia for delivery she vomited and aspirated a considerable amount of partly-digested food. She went violently into spasm, was given artificial respiration, and what could be done with catheter suction was tried. Physical examination two hours later showed some respiratory distress, the lips were cyanosed, temperature 100.2°, and rapid pulse. Râles were noted all over the chest. The percussion note at the right base was dull and breath sounds were diminished over both bases. There was no mediastinal shift. X-ray verified these findings and showed some elevation of the dome of the right diaphragm with small areas of atelectasis probably due to blocking of smaller bronchi of both lungs. The patient, at bronchoscopy, was found to have a considerable amount of mucoid material containing particles of partly-digested food in both lungs. The mucous membrane throughout was extremely oedematous. The patient was sent back to her room feeling considerably improved. Dagenan was given and an uneventful recovery followed.

CASE 5

A.P., aged 25, suffered from repeated colds and post-nasal discharge. He gave the history that two days prior to admission he had had a chill. The following day he suffered pain in his left lower chest and developed a non-productive cough. On admission, his record showed temperature 102.2°, respirations 45 and pulse 130. This man was acutely ill, deeply cyanosed, and it seemed doubtful if he could carry on for long. He was being assisted by carbon dioxide and oxygen by mask. The medical services reported a marked tracheal shift to the left. This left side showed practically no movement and was dull to percussion throughout. Breath sounds were absent over the left lower chest and distant over the upper chest. Bronchoscopy showed the trachea shifted to the left abruptly. The left main bronchus was filled with a thick, yellowish-white secretion bubbling over the carina into the right main bronchus. When this was removed a much thicker fibrinous exudate in the base of the main bronchus extending into both lobes was found. This could be removed only by forceps. Adrenalin was applied. The appearance was that of a very acute infective process forming thick fibrinous casts of the bronchi.

The patient improved remarkably on the table and went back, relatively comfortable, to his room. Pre-

vious to the bronchoscopy, the x-ray showed the left chest opaque with lung detail not visible. The appearance was that of massive collapse. Following the aspiration further x-rays showed increased aeration in the left lung but with the base still not aerated. Two days later bronchoscopy revealed the left lower main bronchus and lower lobe openings filled with a tenacious mucoid plug, blocking entirely the lower lobe lumen. There was evidence of considerable tracheo-bronchitis. Clinically and by x-ray, this was found to increase further the aeration of the left lung. Further bronchoscopies, done at intervals of two and four days, showed gradually less mucoid material and oedema. There was an increase in aeration to the left lung field. The patient was permitted to go home eighteen days after admission. He had a normal temperature for ten days and showed only an adhesion in the left costophrenic angle. This patient's life was saved, I believe, by bronchoscopic aspiration.

CASE 6

J.A., aged 46, an over-worked business executive, gave the story that he had suffered a moderately severe head cold for a few days. Following a bump on his lower chest he reported to his doctor who diagnosed partial atelectasis of his right lower lobe. This was confirmed by x-ray. It was also noted that the trachea was shifted somewhat to the right and that there was some elevation of the dome of the diaphragm on the right side. This man was left for a week during which time he experienced some re-expansion of his lung. During the following week there was no further improvement in the atelectasis and it was decided to try bronchoscopy. Two bronchoscopic aspirations were carried out three days apart which increased considerably the re-expansion of the lung. Some mucoid material was aspirated from the right lower lobe opening on both occasions. X-ray showed a residual pleuritis.

These six cases represent three postoperative cases, one following the aspiration of vomitus, one a drowned lung following an acute infection, and one an atelectasis following a mucous plug during a cold. An assisting cause in this latter case may have been the injury to the chest which made respirations on that side rather shallow because of the pain.

I had intended to add another foreign body case, namely a tooth in the bronchus. This patient had suffered an unexplained atelectasis for several weeks. A tooth was discovered in the lower bronchus. Its removal enabled the lung to make nearly complete re-expansion in twenty-four hours. Unfortunately, the original x-ray plate showing the tooth was missing, so I am not describing the case more fully.

There are one or two points about bronchoscopic aspiration about which I should like particularly to say a word. There seems to be an idea prevalent in some quarters that bronchoscopy is a rather terrible ordeal and one that might be, in cases such as I have mentioned, the crowning stroke to an already ill patient. Without exception I believe all these patients felt more comfortable either immediately or a few minutes after this procedure.

These cases were all done in the operating room. In the postoperative cases, the surgeon is naturally apprehensive about having them moved thirty-six to forty-eight hours after a major operation. With care this task can be accomplished without any disturbance to the patient or the incision. This work could be done in the patient's room by turning the patient diagonally across the bed with the head and neck over the side. The advantages of the operating room with its ready equipment and personnel I think greatly outweigh the risk of moving the patient.

One other point; there seems to be a demand from some quarters for the use of catheter suction instead of the bronchoscope. With the marked increase in intratracheal anaesthesia, the number of men who can pass an intratracheal catheter is greatly increased. Where bronchoscopy is not available in smaller hospitals or in an emergency, I believe if a little 5% cocaine were sprayed into the throat and larynx and this procedure carried out the results in many cases would be very gratifying. With the ordinary catheter with a single lumen the patient must be given an opportunity to get a breath frequently while sucking, as he has probably already serious respiratory embarrassment. Once the catheter is through the vocal cords it is proceeding blindly. If it is a soft catheter you have little idea where it is. Should it be a firm catheter, attempts to guide it blindly would be, at best, very irritating to the mucosa. With any degree of mediastinal shift, it is unlikely to enter the narrow affected bronchus.

The bronchoscope, on the other hand, is just as easily passed in trained hands. It has separate channels for air and suction and permits under direct vision an opportunity to see the trouble and treat it intelligently. Blood clots, thick secretions, and foreign bodies can be removed, and medicaments such as adrenalin can be applied to the swollen mucosa, permitting actual suction into the area in greatest trouble. No one would blindly remove a foreign body from the oesophagus with a probang, or work in the abdomen in the dark, if he could help it. The parallel holds here.

In some instances we were in doubt as to whether bronchopneumonia or collapse was the predominant feature. It is not intended to advocate bronchoscopic aspiration for bronchopneumonia. Yet this condition need not be a deterring factor to bronchoscopic treatment.

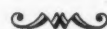
Even in those cases where bronchopneumonia was predominant, we felt that, while their improvement was not comparable to the straight collapse cases, they too were improved clinically.

Atelectasis may occur wherever there is interference with bronchial drainage and normal pulmonary ventilation. It is a common postoperative complication, particularly in abdominal operations.

Bronchoscopic aspiration offers a safe means of promoting better drainage by removing thick secretions or other obstructing materials, thus enabling better ventilation. All possible preventive measures should be instituted, both before, during, and after any operative procedure. Mild cases should be assisted to cough and hyperventilate their lungs. At the same time, it should be remembered that it is in the early stages of massive collapse before the onset of possible complications that bronchoscopic aspiration can fulfil its best service. There are those who hold that all these cases will get better by themselves. In at least two cases of this series I cannot hold with that opinion. In addition, the rapid clearance of atelectasis must lessen complications such as pneumonia, lung abscess and later chronic lung infections which may carry a subsequent high mortality rate. In some minimal cases of atelectasis where bronchoscopic aspiration was not used I am told by our medical services that the recovery period was considerably longer than cases in this series which had a much greater involvement.

All of the cases described were either under the care of our Chest Service or were treated in conjunction with medical men. Surgeon, internist, radiologist and bronchoscopist should co-operate to assure the best treatment for the patient. Bronchoscopic aspiration will then assume its proper place as an extremely useful treatment in the management of massive pulmonary collapse.

A sound mind in a sound body is a short but full description of a happy state in this world. He that has these two has little more to wish for and he that wants either of them will be but little better for anything else.—John Locke.



OROPHARYNGEAL ULCERATION WITH CONJUNCTIVITIS AND SKIN LESIONS*

By Captain S. J. Shane, R.C.A.M.C.

Halifax

THE following case is presented mainly for discussion and record. I realize that the causation has not been proved, and any contribution to its explanation would be welcomed.

CASE REPORT

A private, aged 23, was admitted to the medical ward of the Halifax Military Hospital on November 20, 1942. At that time he complained of a "cold" with a sore chest and a non-productive cough. His family, personal, and functional histories were negative, with the exception of the fact that he complained of having had a cold all winter, with a cough and a small amount of sputum. Physical examination disclosed all systems to be negative with the exception of the chest, where the breath sounds were found to be harsh, although no râles or rhonchi were heard; and the throat, which was very slightly inflamed. The temperature was 101°, pulse 102. A tentative diagnosis of acute bronchitis was made and symptomatic measures, particularly steam inhalations, were instituted. No other treatment was given at the time.

On the following day no improvement had taken place. The temperature had risen to 103.4° and a few fine râles were heard at both bases. The hgb. was 75%; leucocytes, 8,850. Sputum showed many pus cells and a few short chains of streptococci. On the basis of these chest findings the diagnosis was changed tentatively to broncho-pneumonia and sulfathiazole was given in full dosage.

No great change occurred until 4 days later, when small canker-like sores began to appear under the tongue. On the 5th day, small bullæ were noted on the buccal mucus membrane, and a moderately severe conjunctivitis was observed. These symptoms gradually became worse, and on the following day the eyelids were markedly swollen and oedematous, with a thin seropurulent exudate in the conjunctival sacs. A whitish exudate was also noted covering the palate and buccal mucous membrane, and on the same day a scattered maculo-papular eruption with lesions up to 1.5 cm. in diameter appeared on the trunk and limbs. The original inflammation of the buccal mucous membrane had apparently extended downwards into the larynx as there were new signs and symptoms of a severe laryngitis. X-ray of the chest showed the hilar and descending bronchial markings to be heavy, but the lung parenchyma was clear. The x-ray diagnosis was acute bilateral bronchitis.

At about this time the general condition of the patient began to deteriorate. He became severely nauseated and vomited frequently. His temperature varied from 101 to 103°. His fluid balance became markedly disturbed and it became necessary to give repeated intravenous injections of glucose in saline. Within the next few days much of the inflamed buccal mucous membrane had sloughed off, leaving considerable residual ulceration in the mouth and pharynx. Smears from the eyes showed a few diphtheroids and some Gram-positive cocci. Smears from the mouth revealed some pus cells, abundant *Borrelia vincenti* and *B. fusiformis* and some staphylococci and streptococci. The blood Kahn test was negative.

The acute episode which has been described above was assumed by us to have been a severe sulfathiazole reaction, an assumption which was corro-

borated by one of the medical officers of the Royal Canadian Navy who was stationed in Halifax and who had seen numerous such sulfathiazole reactions in the past. On this basis the sulfathiazole was discontinued on the 5th day when the first oral symptoms began to manifest themselves. Under a routine of supportive treatment, the patient's general condition began to improve and by December 8, 1942, it was unnecessary to further supplement his fluid intake. On this date also the chest x-ray showed small areas of pneumonitis at both lung bases in addition to the previously reported bronchitis. The patient continued to improve gradually under a high calorie diet with supplementary vitamins and iron, and by January 28, 1943, he was able to be discharged, that is, over two months following his admission. Even at the time of his discharge, the skin lesion was still present although it had markedly retrogressed. There remained now scattered macular areas about 1 cm. in diameter, and pigmented, of a pale brownish colour.

This, with a fair degree of accuracy, is the report of the case as it presented itself to us. I have purposely refrained from introducing any conflicting details until the case should have been completely presented, because the points about which I wish to raise a question did not occur to us until the acute phase of the situation had largely subsided. However, in the course of discussion among the medical staff of the hospital, it was revealed that there had been numerous cases reported in the literature within the past year or so in which a similar symptom-complex occurred in persons who had had no sulfonamide therapy. This immediately raised the question as to whether the acute episode which our patient suffered, and which has been described above, was truly a sulfonamide reaction or whether it belonged to the group of cases which I shall now describe to you.

Three of these cases are reported in the *British Medical Journal* for September, 1942; three are reported in *The Lancet* for August, 1941; and three occurred in the wards of the Halifax Military Hospital some time prior to the case which has just been presented. I should like to detail a few sample cases for the purpose of emphasizing the similarities between them and the case which I have just described.

The first case is from the *British Medical Journal* of September 5, 1942.

An AC2, aged 19, was admitted to hospital on May 17, 1940. Seven days previously he had had a slight sore throat which had abated until two days before his admission, when it recrudesced simultaneously with the appearance of a sore mouth. When first seen he was obviously very ill. Cyanosis and dyspnoea were present. His temperature was 104°; pulse 140. He complained of dysphagia, and trismus had developed. The mucous membrane of the lips, gingiva, and soft palate, was covered with a whitish gray tenacious exudate which on removal, revealed shallow ulcers that bled freely. Smears from the mouth showed a few Vincent's organisms with large numbers of Gram-positive cocci. A general examination revealed no

* Read before the Halifax Medical Society, March 3, 1943.

gross abnormality except the presence of moist râles at the left base. Sulfanilamide was given, 8 grams being taken in the first twenty-four hours. The following day he seemed to have improved slightly and the temperature had fallen to 100°. A skin lesion was now present, taking the form of a vesicular eruption on an erythematous base. In addition, conjunctivitis appeared and a sticky discharge covered the lid margins. On the following day the patient's general condition had begun to show a rapid deterioration. The temperature had risen again. He was taking little nourishment and the prostration was alarming. Five hundred c.c. of fresh whole blood was then given. At this time the skin lesion had reached its maximum extent, being present on the arms, legs, and chest.

The following morning, the patient was greatly improved and during the next four days the temperature showed a gradual return to normal. On May 24 the chest was radiographed and evidence was found of a resolving bilateral broncho-pneumonia. From about this time onward the skin lesion started to fade and in the mouth the membrane began to separate, leaving behind a painful hæmorrhagic surface. It was not until June 5 that the mouth lesion was completely resolved. The patient was discharged from hospital on June 21, and so far no other attacks have occurred.

The other two cases which are described in this report are essentially similar to that just detailed, and to our original case. The points of similarity include: (1) the presence of conjunctivitis; (2) the occurrence of an ulcero-membranous stomatitis; (3) the presence of a somewhat obscure skin lesion; (4) the occurrence of marked prostration and disturbance of fluid balance; (5) the necessity of treatment by intravenous fluids or transfusion.

The only point of difference between this series of cases and the original case described was that in our case the sulfonamides had been given prior to the onset of the acute symptoms, while in these cases they were given subsequently; in fact, for the purpose of treatment. Although Vincent's organisms were found in all cases, the predominating organisms as shown on culture seem to have been staphylococci, streptococci, and diphtheroids. The points of similarity between these case reports instilled a strong feeling into our minds that the symptom complex from which our patient suffered was not due to the administration of sulfonamides but was rather of the nature of an atypical ulcero-membranous stomatitis and conjunctivitis of rather obscure origin. Our point of view on this subject was further strengthened by the discovery of three more cases which had been carefully studied by Captain J. A. Langille who was recently on the staff of the Halifax Military Hospital.

I should like to give details of the most typical of these three cases:

A private, aged 23, was admitted to the Halifax Military Hospital on May 24, 1942. On examination there was a rather profuse purulent discharge from both eyes. The eyelids were swollen and inflamed. There was moderate photophobia, and a severe conjunctivitis was present. The lips were cracked and inflamed and all the buccal, lingual, and palatal mucous membranes were covered with a thick creamy-white membrane which was almost gangrenous, since it broke up rapidly when removal was attempted with the tongue depressor. The underlying tissues bled quite freely. The remainder of the physical examination was negative except for a few spots scattered over the body, about ¼" in diameter, bronze in colour, rather scaly in appearance, and distributed over the arms, legs, chest, abdomen, and back. There was a profuse sanguino-purulent discharge from the mouth. The temperature ranged from 101°. The Kahn test was repeatedly negative. Numerous smears and swabs were taken, a mixed flora being reported in each. A Gram-positive diplococcus was the only organism common to all. *Borrelia vincenti* was found in only one specimen.

The other two cases in this series are essentially similar, the common features being conjunctivitis, severe ulcero-membranous stomatitis, moderate to marked prostration, the presence of a skin lesion, and the finding of Vincent's organisms in smears, overshadowed, however, by the occurrence of other organisms in heavier concentrations.

Although this series of cases is not exactly similar to those previously reported, the similarity is sufficiently close to consider them as belonging to an allied group; furthermore, the close likeness between these two series still further tends to corroborate our feeling that our original problem was not of the nature of a sulfathiazole reaction but belonged rather to the type of condition that I have just described.

This impression is still further strengthened by the report of three unusual cases of acute ulcerative stomatitis from No. 5 Canadian General Hospital Overseas, reported in *The Lancet*, August 23, 1941. I should like to recall the most typical of these three.

A Canadian officer, aged 21, was admitted on October 28, 1940. Four days previously his gums and lips had become dry and sore. They became progressively worse and he felt generally ill. On admission he was severely ill, with a temperature of 101.5°. There was acute conjunctivitis with thin purulent secretion. His lips were swollen and deeply cyanosed and their inner surface had several large shallow ulcers covered with an adherent grayish false membrane which bled on being disturbed. The whole mucous membrane of the mouth was similarly affected and the lesions extended back to the soft palate, tonsillar pillars and pharynx. He had considerable difficulty in opening his mouth and in swallowing. The breath was not fetid. Smears taken from the ulcers and the conjunctival exudate showed numerous Gram-positive encapsulated diplococci. No other organisms were found. There was no response to sulfonamides. During the next few days his condition became steadily worse and as a last resort blood transfusion was given. Within a few hours there was a striking

change in his whole condition. The temperature fell to 99°, and he began to feel and look much better. He steadily improved and ten days after admission he was discharged, completely recovered.

The other cases in this series are essentially the same, the outstanding points of similarity being: (1) the marked severity of the local condition; (2) the very severe general toxæmia; (3) the absence of prior administration of sulfonamides; (4) the lack of response to sulfonamides; (5) the dramatic response to blood transfusion.

It will be noted that this series of cases showed no skin lesion such as was present in the case described in this hospital but the conjunctival and oral manifestations are of a sufficiently like nature to warrant their inclusion in this group.

SUMMARY

1. A case is described in which the outstanding features were a severe conjunctivitis, a marked ulcero-membranous stomatitis, an obscure skin lesion, and a generalized toxæmia with marked prostration.
2. This symptom-complex occurred following sulfonamide therapy and was ascribed to the effect of that therapy.
3. The patient recovered under non-specific treatment after a long period of convalescence.
4. Three series of cases are described exhibiting points of close similarity to the original case, with the exception that these latter cases did not all receive sulfonamide therapy.
5. It is therefore reasoned that in our original case the symptoms were due, not to sulfonamide therapy, but to an obscure causative agent similar to that responsible for the other cases described.

I may add that the Naval and Air Force Hospital installations in Halifax have had similar experiences following sulfonamide therapy; they also find the occurrence of such lesions in non-sulfonamide cases difficult or impossible to explain.

RÉSUMÉ

Histoire d'un cas caractérisé par une conjonctivite grave, une stomatite ulcéro-membraneuse, des lésions cutanées mal définies et un état d'intoxication profonde avec prostration. Ce syndrome, survenu à la suite de la sulfamidothérapie fut attribué à cette médication. Le malade a guéri après avoir été soumis à un traitement non spécifique; la convalescence fut longue. Trois cas à peu près identiques ont été observés, mais chez eux les sulfamidés étaient hors de cause. Il faut donc croire que les sulfamidés ne sont probablement pas l'agent causal de cette étrange affection. Il faut chercher ailleurs l'étiologie exacte de ces manifestations. Le même syndrome a été observé ailleurs, avec et sans le concours des sulfamidés.

JEAN SAUCIER

THE MEDICAL BRANCH OF THE NAVY IN THE FOURTH YEAR OF WAR*

By Surg. Capt. A. McCallum, O.B.E.,
M.D., V.D.

Medical Director General, R.C.N.

IN a large measure the main facts of this survey are a repetition of what has already been told by the written or spoken word; nevertheless, one of the most intriguing parts of the story is the consistency of the results obtained in the clinical field. We note that with each compilation of the statistics regarding the examination of recruits the rejection rate remains about the same. This has never been lower than 10.3% nor higher than 11.8%, and for the two-year period—May 1, 1941 to May 1, 1943—it is 10.4%.

Similarly, if we take stock of the total hospital days compared with the days available for work, we find a loss of 2.7% which is 9.8 days per man per annum. (From the beginning of the war until May 1, 1943, there have been 678,515 hospital days.)

From numerous surveys made in pre-war days in the field of industry it has generally been accepted that from 9 to 9½ days per man per annum is the normal loss to be expected. If industry be a yardstick, one must still compare the hazards encountered by those on active service who are subjected to inclement weather, slippery decks, crowded living quarters, the handling of heavy and dangerous equipment and armament, and for the most part the entire lack of home comforts and surroundings. Consequently, we can take considerable satisfaction in noting that time loss in the Navy under all conditions afloat and ashore is practically identical with that of industry.

To make the picture even better, it should be noted that in the ordinary pursuits of civil life the presence of the milder contagious diseases amongst adults is almost negligible, but just as soon as men are concentrated into barracks or camps the incidence of measles, mumps and chicken-pox rises rapidly and while they are attended by little that is serious they certainly account for a large percentage of time loss. Could this peculiar circumstance of the prevalence of these diseases be eliminated, time loss would be reduced by about 20%.

* Reprinted from "Original Articles by Medical Officers of the Royal Canadian Navy", vol. 4, June 15, 1943.

TABLE I.
SUMMARY OF RECRUITS EXAMINED AND REJECTED MAY 1, 1941, TO APRIL 30, 1943 (INCLUSIVE)

Divisions	Number examined	Rejected for															Rejected	
		Arthritis & rheumatism	Cardio- vascular	Digestive (Not ulcers)	Deformities and injuries	Ear	Eye { Colour vision	Foot	Genito- urinary	Hernia	Nervous and mental	Peptic ulcer	Respiratory Non Tbc.	Skin	Tbc.	Misc.		
Charlottetown	861	5	17	1	4	21	28	3	2	10	3	5	9	1	23	10	149	18.2
Halifax	3,892	4	30	2	19	51	108	14	12	12	6	5	23	0	44	41	371	9.5
Quebec	981	3	18	3	14	14	39	2	6	5	1	0	6	3	24	35	173	17.6
Saint John, N.B.	1,063	0	14	8	12	15	46	9	9	6	3	2	7	1	7	8	147	13.7
Montreal	6,067	11	51	10	16	70	114	14	6	59	12	4	18	7	61	92	545	8.9
Ottawa	3,256	1	11	5	14	26	80	8	6	28	6	3	12	4	35	36	275	8.4
Kingston	1,473	2	42	2	15	20	31	1	6	10	11	2	13	1	4	14	174	11.1
Toronto	7,126	7	30	5	21	52	83	9	17	44	13	5	17	3	13	46	364	5.1
Windsor	2,017	8	43	19	26	39	101	12	6	32	6	4	16	4	10	39	385	19.0
Hamilton	3,662	0	31	8	21	48	99	7	16	36	7	5	14	4	11	42	349	9.5
London	2,902	4	43	2	31	36	113	20	20	40	11	3	17	11	11	61	423	11.1
Port Arthur	1,577	3	33	13	25	25	35	6	1	18	5	11	19	3	7	28	217	13.7
Winnipeg	4,685	2	42	7	31	31	185	2	14	61	1	17	9	1	26	184	633	13.5
Edmonton	2,145	0	14	2	18	18	45	7	11	17	10	6	4	1	8	43	200	9.3
Calgary	2,145	8	13	1	20	20	26	10	0	24	8	11	17	7	12	27	199	9.3
Regina	1,476	5	22	1	23	23	36	1	23	16	6	1	14	2	8	27	192	13.1
Saskatoon	2,248	12	30	0	26	26	59	7	46	29	9	15	18	7	10	93	376	16.7
Vancouver	5,652	4	59	18	39	39	95	8	17	27	15	15	36	10	15	41	429	7.5
Esquimalt	3,824	4	50	23	25	25	101	10	6	9	26	13	14	5	9	26	337	8.8
Total	57,052	83	592	130	355	599	1,424	150	224	483	159	125	283	75	338	893	5,938	10.4
% Unfit with		1.4	9.9	2.2	5.9	10.8	23.9	2.5	3.7	8.1	2.2	2.1	4.6	1.2	5.6	15.0		
% Of examined rejected for		0.14	1.1	0.2	0.6	1.1	2.5	0.2	0.3	0.8	0.2	0.2	0.5	0.13	0.6	1.5		

TABLE II.
DEATHS, ROYAL CANADIAN NAVY
COVERING PERIOD SEPTEMBER 1, 1939 TO JUNE 1, 1943
DIED OF DISEASE, CANADA ONLY

Cause	No. of cases
Cerebrospinal meningitis.....	2
Cavernous sinus thrombosis.....	1
Diphtheria.....	3
Cerebral hæmorrhage (congenital aneurysm).....	1
Tuberculous meningitis.....	2
Pneumococcal meningitis.....	2
Miliary tuberculosis.....	1
Heart conditions.....	6
Rheumatic heart disease.....	1
Pulmonary tuberculosis.....	1
Peritonitis.....	3
Pancreatitis.....	1
Liver necrosis.....	1
Pneumonia.....	4
Hæmorrhage (pulmonary).....	1
Encephalitis.....	1
Leukæmia.....	1
Agranulocytosis.....	1
Streptococcus throat.....	1
Carcinoma of lungs.....	2
Carcinoma of stomach.....	1
Appendicitis.....	3
Ruptured peptic ulcer.....	1
Intestinal obstruction.....	1
Nephritis.....	1
Septicæmia.....	2
Postoperative herniotomy.....	1
Anæsthetic (procaine sensitivity).....	1
Pulmonary embolus (postoperative carcinoma of the stomach).....	1
Total.....	48

Of the more serious diseases it is interesting to note that from the beginning of the war until May 1, there have been 653 cases of scarlet fever without a death; 43 cases of cerebrospinal meningitis with but two deaths; 300 cases of diphtheria with three deaths, and 1,079 cases of pneumonia with three deaths. Altogether from the beginning of the war to date there have been only 48 deaths exclusive of enemy action or accidental drownings. A summary of these deaths is attached.

The most striking feature of this summary is how few deaths there were from conditions which afforded even a remote chance at treatment. Of the six deaths from heart conditions, five were almost instantaneous from coronary thrombosis. One youth of 24 years dropped dead in a restaurant and post mortem revealed a ruptured congenital cerebral aneurysm. Such conditions, along with the carcinomas, miliary tuberculosis, blood dyscrasias, and pulmonary hæmorrhage, give little or no opportunity for treatment. Some might ask why coronaries and carcinomata should occur in the age-group represented in active service, but it must be borne in mind that there is quite a large number in the Service at middle age or beyond who were on the point of retiring when war inter-

vened. Others who had already gone out on pension returned to service and have made a valuable contribution through their experience. To sum up the clinical picture it can be said that the statistics indicate early, adequate and scientific treatment by a well-trained personnel.

The growth of the Nursing Service has been very gradual. It has kept pace with requirements indicated by the opening up of new hospitals. An effort has been made to select those who have had considerable training, particularly in supervision, observing that a large part of their work involves the instruction of Sick Berth ratings.

The Nursing Service includes all those of commissioned rank who have to do with the health of the sick, whether this be in bedside nursing or the dietitians' supervision of what the patient eats, or the technicians' work in the laboratories, the physiotherapists' effort on an impaired joint, the occupational branch of physiotherapy which endeavours to re-educate and rehabilitate those mentally ill or would become so if not usefully occupied, or the Home Sisters whose chief interest is the comfort and well being of all members of the Nursing Service of which they form a part. At this date the Nursing Service numbers 168.

Gracious recognition of the Nursing Service was made in His Majesty's Birthday Honours by the award of the Associate Royal Red Cross Decoration to Matrons Stibbard and Russell. To them we extend our felicitations.

The Sick Berth staff has also reached large proportions and now numbers nearly 1,100. With the increasing shortage in manpower it was necessary to look to the W.R.C.N.S. for additional help in much of the work formerly carried out by Sick Berth Attendants. It is thought that upwards of 500 "Wren" S.B.A.'s can be used by next March.

There are now four lady medical officers in our Service. Their status has undergone revision and they no longer belong to the "Wrens" but are Surgeon-Lieutenants, R.C.N.V.R. While it is possible the major part of their duties will be with the "Wren" personnel, there will be other fields for their activities such as hospital work. They will not be seafaring M.O.'s!

Our overseas medical officers who have been serving in the Royal Navy continue to drift home after approximately two years in foreign waters. Amongst the latest arrivals are McRitchie who saw plenty of action with a Marine Division at the evacuation of Crete, and Tait

who was in the same show, running transports from Crete to Alexandria. He tells us there was plenty of clinical material for the M.O.'s services on those trips. Crutchlow is our most recent arrival and looks somewhat well dressed with his O.B.E. decoration. The Medical Branch now boasts 8 decorations and 7 mentions in despatches. When our representatives from abroad come home they are promptly replaced by others anxious to serve overseas. By these replacements there has been a total of 69 M.O.'s given an opportunity for service in the Royal Navy.

The work of the R.C.N. Medical Research Unit continues to be energetic, intensive and of very practical value. In the whole field of research, academic questions have been placed in abeyance for the duration and only those matters which are of prime importance towards winning the war are receiving consideration. Details of the activities of the R.C.N. Medical Research Unit are contained in a separate article.

Every effort has been made to provide refresher courses where it seems appropriate. The universities and teaching hospitals have been most generous in making short courses available. In some cases it has been necessary for the officer taking the course to pay his own tuition fees but the Service has been generous in the time allotted with pay and allowances so that the medical service may be kept keen and alert in modern therapy. So far it has been possible to provide courses of varying periods and experience for 44 medical officers. In addition 30 M.O.'s have completed a short course in the Medical Aspects of Chemical Warfare, and others will take the course as convenient. Ultimately it is hoped that all medical officers will have a working knowledge of this subject.

On the whole, the work of the medical branch of the R.C.N. seems to have been well received by other branches in our own Service and by our sister Services, with whom we have the closest co-operation. Every effort has been made to avoid overlapping in personnel, equipment and hospitals so that adequate medical care might be supplied with due economy. Specialists are freely shared with sister Services, as are hospital beds, and in these days when so much is written and said about Social Security, Health Insurance or State Medicine, those who will ultimately implement such suggestions might well look to the example set by the Services in these matters.

THE EVACUATION FROM GREECE

By Surg.-Lieut. W. M. Tait, R.C.N.V.R.

THIS is an attempt to relate from memory some of the events which took place during the evacuation of the British Imperial Forces from Greece (sometimes called the Second Odyssey) at which I was fortunate enough to be present.

At that time I was serving on a converted passenger-freight ship of about 10,000 tons, rebuilt for the purpose of carrying troops on combined operations. She was well-armed and carried flat-bottomed landing barges to ferry the troops back and forth to shore. The Sick Bay was well equipped with 18 cots, a dispensary, an operating theatre and an x-ray room. Below were two medical distributing centres, fully equipped to be used as operating theatres in case of emergencies. In all, she was adequate for her job, which was the carrying of Commando troops for raiding parties.

Towards the end of April, 1941, we were anchored in the harbour of Alexandria awaiting orders for our next move. Daily the hot Egyptian sun blazed down from a cloudless sky on that really magnificent anchorage giving to the whole scene an atmosphere of peace and tranquillity. Having spent a lazy day on the beach, some of us came aboard one evening to be told that all further leave was cancelled. The ship was under sailing orders. Immediately "buzzes" started floating around as to where and what we were going to do. Those who have served afloat know what a "buzz" is once it gets started. However, we were satisfied and put out of our misery when it was announced that we were sailing in the morning for the island of Crete. This was greeted with much approval and enthusiasm. I tried vainly to recall something about the history of Crete but all I could remember was that it had figured largely in ancient Greek and Roman history.

If I remember rightly, the distance from Alexandria to Suda Bay, Crete, is roughly 450 miles, about a full day's run at an average speed. Actually it was more than that as all ships were obliged to zig-zag in order to avoid detection by submarine and aircraft. We weighed anchor in the morning and arrived at Crete the following morning, the trip being without incident. Suda Bay (on the map, Canea Bay), on the north-west corner of Crete, is an

excellent harbour sheltered by high hills and used a great deal by the Navy in peacetime. Due to all the excitement on board it was difficult to settle down to admire the landscape in any great detail, or to try and imagine what the old Cretans had been like in days gone by. Most of us had some idea of what lay ahead as we had heard that the British troops in Greece had been driven down to the sea and that the situation was critical. The betting was that our part in the removal of these troops would be pretty exciting.

In the meantime every body had his duties to perform, and that included the medical officers. We were very busy putting final touches to arrangements in the Sick Bay in order to handle the large number of wounded which we fully expected. Besides the Sick Bay which was on the main deck, and the two medical distributing centres which were below the armoured deck, we cleared out the Chief Petty Officers' and Petty Officers' messes below, to be used solely for stretcher cases. Finally we had everything and everybody ready for any emergency which might arise.

We weighed anchor in the afternoon and started for Greece. Our destination was the Gulf of Nauplia, which lies just to the south of the Piraeus, a distance of roughly 150 miles from Suda Bay. There were other ships in the convoy plus an escort of destroyers. The first inkling that we were not going to have it all our own way came at about 1700 (5.00 p.m.). We were cruising along very peacefully, on a lovely sunny day, some of us on deck admiring the scenery, when suddenly there was a roaring sound coupled with machine-gun fire. We all ducked instinctively. At the same time the alarm buzzer for "Action Stations" sounded. This was for us, as the gun-crews had been closed up all day at their posts. It took perhaps a quarter of a minute to realize that we were being dive-bombed and in no uncertain manner. The next thing I knew I was down below at my "Action Stations" complete with tin-hat and "rubber-tire". How I got there I do not remember. No sooner had I arrived when there was a terrific crash for'ard and the ship shook from stem to stern. Everybody exclaimed, "Whoops chaps! we've caught one". They were quite right. Fortunately the attack did not last long and it was all over in about half an hour. What had happened was that five Ju87's—Jerry's twin-engined dive-bombers—had dived

on us out of the sun, a favourite trick of theirs. Nobody saw or heard them until the first one dropped his bombs alongside. It was a perfectly executed attack. The ship was hit only once, the bomb landing on the fo'cas'le head, cutting through both anchor cables, exploding in the paint shop below and setting us on fire. Incidentally, the fire is probably what saved us as Jerry no doubt thought that he had finished us and so departed.

Casualties from this show were few; three men partially suffocated with smoke, one fractured femur and four badly lacerated scalps and faces from flying splinters. These were promptly dealt with. All the men behaved very well during this action, and the gun-crews did a magnificent job, although I do not think we shot down any planes. It was not the first time we had been bombed or under fire, so it was not a new experience.

Having got the fire under control, we carried on towards our destination. Arriving at the Gulf of Nauplia we remained about two miles off shore as it was too dangerous to go alongside the jetty. One ship did make the attempt but ran aground. It was dark at the time, about 9.00 p.m. Immediately the real job started, an experience which I shall never forget. To attempt to relate in detail the events which took place during the evacuation would be impossible. Everybody had his job to do and did it to the utmost of his ability, as can be judged by the complete success of the whole show. We in the medical department found ourselves almost snowed under with wounded, walking and stretcher cases. It was a sight difficult to describe by word of mouth or pen to anyone who has not actually witnessed it. The troops came aboard covered with mud and dust, clothing torn and ragged, bandages on their heads, hands, and everywhere else, a picture of utter exhaustion, with staring eyes and a beaten unbelieving look in their faces. They dragged themselves on board, flopped down on deck and almost immediately fell asleep. It was a dreadful sight. They had been harassed for days on end, dive-bombed and machine-gunned, hiding by day, walking by night, every man for himself. It was human nature in the raw and right down to zero. The decks became so closely packed that as one moved about one literally walked on the sleeping men, but they never stirred.

They came aboard in streams, altogether over 5,000 on a ship made to take only about 3,000, but still we packed them in and were glad to do it. The medical officers had their hands full as can be imagined. We had over 200 seriously wounded men; wounds of every description from the top of the head to the soles of the feet. I remember saying to myself, "How will we ever get them sorted out and dealt with?" However, we did, and the Sick Bay staff are to be complimented on the manner in which they handled a situation at sea as difficult as one could ever imagine. Every wounded man was treated. There were only two deaths in the whole lot and they were cases for which nothing could have been done.

The troops started coming aboard at approximately 10.00 p.m. and by 4.00 a.m. we had all we could take on board. We crept away from Nauplia just before daybreak and started back for Crete. At dawn we were again the "target for today" as Jerry had by this time got wind that something was up. There was an almost continuous air raid warning "red" and that blood-chilling pipe, "A-A gun-crews close up", was forever in our ears. Despite their fatigue and lack of sleep the troops rallied every time aircraft came near us. They grabbed their rifles, Bren-guns or whatever they had and fired into the sky, some standing, some sitting, others lying on their backs cursing and swearing at Jerry all the while. Fortunately all bombs dropped wide of us. It was a magnificent display of fighting spirit amongst such a desperately worn-out group of men. It is not until one really gets into the front line and is confronted with the results of war, casualties and men dying, that one realizes what a grim and ghastly business war can be. It is impossible to describe the feeling one has; only those who have actually sensed it themselves can understand. It is not something one can talk about, read about, or write about; it is something one has to experience.

Eventually we reached Crete and there unloaded our troops. By this time they had partly recovered and, as usual amongst British troops, there was the irrepressible wag. As the men were being loaded into the boats I heard a Cockney voice say, "Any more for the Skylark? Round the battleship tuppence". In another barge some wounded Aussies were singing, "Oh, I do like to be beside the seaside",—and so on. There were many grateful faces turned up to

us from the boats as they left the ship's side. I felt immensely proud that I belonged to the Navy.

After a fitful night's sleep we left the following day bound again for Greece. Some of us were a bit jittery by this time due to the fact that we had had very little sleep, also because we had had a slight taste of what to expect. The ship was in a mess, with both anchors gone, the forward part burned out, a hole in her bow and the decks littered with the refuse of the departed troops. The medical department was in a fix too. We had used practically all our supplies on the first batch of wounded. What was to be done for the next batch was a problem. However we managed to get things cleaned up and in readiness.

The second trip to Greece was a repetition of the first up to the point when things took a decided change. We arrived off the coast about 5.00 p.m. when it was still daylight, too early to go in. We were obliged to cruise up and down for a bit. It was remarked, "we were just asking for it", and sure enough "we got it". We had been at Action Stations all day, so it really wasn't a complete surprise when about twenty air-craft came over and opened the ball. We had been bombed before on several occasions but never anything like this. There was a most unholy row going on up top—A-A guns firing, planes and bombs screaming down,—the suspense was terrific. I remember wishing they would hit us somewhere and put an end to it. Finally we *were* hit, a bomb slicing us down the starboard side about 'midships, blowing a good-sized hole in the ship and immediately flooding the engine room. The ship lurched from side to side then started to settle—a most uncanny sensation. "Here's where we swim for it", we thought. But no—she settled down comfortably and stayed there. All the lights went out but the emergency lighting came on and was very effective. Amazingly enough, we had only one casualty, a rating with a bit of shrapnel in his buttocks.

Talking to one of the signalmen on the bridge afterwards, he told me that it was his job to keep an eye on aircraft in general and bombs in particular and to inform the Captain roughly where he thought the bombs were heading. When the one that hit us was coming down he just stood and watched, absolutely frozen stiff and speechless. He could have sworn that it was headed straight down the funnel but he

couldn't get a squeak out to tell the Captain. Lucky for us it didn't go down the funnel or this story would never have been written.

So, our active participation in the evacuation from Greece was suddenly brought to an abrupt end. There we were, floating idly on the ocean, praying that Jerry would not come back to finish us off. Apparently the ship was going to float; that was something to be thankful for. We could still lower our landing craft and this was done almost at once. These small craft left us that same evening to pick up a detachment of troops who had been cut off somewhere along the Grecian coast. I know nothing really of this episode, other than that it was successful, the troops being taken aboard a cruiser which was lying off the coast. Our landing craft were then abandoned and interestingly enough, the Germans are said to have used them again during their invasion of Crete some weeks later. This, however, is only hearsay.

To return to our ship. About dusk a destroyer came alongside to find out what was to be done with us. I think that I am right in saying that the destroyer's Captain was all for taking the ship's company off and then sinking the ship, although I have no authority for saying this. However, our Captain was firm and said he would take his ship back as long as she would float. This point decided, the destroyer proceeded to take us in tow. The wires kept breaking so that I thought we would never get away. Finally one held and we were off. The destroyer towed us along at the amazing speed of nine knots, despite the fact that we were a water-laden ship and an absolute dead weight. It is interesting to note that this same destroyer, *H.M.S. Griffin*, has only recently been turned over to the Canadian Navy, and is now known as "*H.M.C.S.*"

We got under way as dawn was breaking. Our feelings at that time were difficult to describe—possibly like a worm being towed at the end of a fish hook. We fully expected to be blasted out of the water at any moment. Although Jerry bombed a convoy from Greece only a few miles away, he never once bothered us. For that we were most thankful.

We were towed to Kisamou Bay, which lies on the extreme north-west tip of Crete. There most of us were detailed to go aboard the destroyer as our Captain felt that the ship would not float for long. So with bag and baggage we piled aboard the *Griffin*, which was to take

us to Suda Bay and there put us ashore. Eventually we arrived at Suda Bay after a most enjoyable and thrilling ride at high speed. Just as we were coming up to our anchorage and were preparing to disembark, the destroyer received a rush call to go back to Greece again, this time to pick up survivors from ships that had been sunk during the previous day. So off we went to Greece. Some of us managed to snatch a few hours' sleep in the Ward-Room as we knew there would be no sleeping off the Grecian coast. At daybreak the first survivors were sighted. Poor chaps, they had been in the water since the previous afternoon. We went alongside, threw them a line and hauled them aboard. They were covered with fuel-oil but the majority were in surprisingly good shape. Some of the Cauley Rafts which came alongside held only dead; these fellows had been machine-gunned while in the water, a procedure at which Jerry was rather adept at that time. We kept this up until we had rescued roughly fifty men. It was a busy time for all concerned, taking these men aboard, getting them cleaned off, attending to their wounds and finding clothes for them to wear. Then we headed back for Crete.

On arrival in Suda Bay, we were all put ashore to await our fate. What would happen to us now? We were herded together on shore like prize cattle and told to wait there for further orders which would be issued forthwith. Everybody was tired, dirty, hungry, thirsty, and a bit fed up with the whole show. There were air-raid warnings almost every hour, which kept us all busy hunting for shelter. At one time we found a delightful spot in a field of clover, very cosy except for the bumble-bees who would not leave us alone. Jerry too had a nasty habit of suddenly appearing around a hill, coming in with his motors shut off, which annoyed us considerably, and then there would be a mad dash for cover. We spent two days of this "hide and seek", then finally it was decided to send us back to Alexandria on a freighter. This was good news, as we had had visions of settling down in Crete for the duration. The ship was literally jammed with people, most of them survivors like ourselves. Luckily we managed to obtain the smoking room for our little party so at least we had some privacy. For food we had biscuits and corn syrup, which we survived on quite nicely for the three days which it took us to reach port. Except for air-raid warnings

practically all the time and an attack by German E-boats the first night out, the trip was without incident.

Finally the most welcome sight of all came into view, the harbour of Alexandria. We arrived safe and well but a little the worse for wear. Thus ended our participation in the evacuation of Greece, our sojourn on the island of Crete and our trip back to Egypt. Life had been pretty exciting for us since leaving Alexandria, a more thrilling experience one could hardly hope for. Everyone was just a little bit glad that for the moment it was over and we were back to a place where we could have a much-needed wash, a good meal and a sleep.

Case Report

SENSITIVITY TO SULFATHIAZOLE

(Report of a Fatal Case)

By George E. White, M.B., F.R.C.P.(C)

Windsor, Ont.

The following case of sulfathiazole sensitivity may be added to those already recorded in the literature. It is of interest because of the widespread use of the drug. It is well that we should recognize the signs of toxæmia or sensitivity, and be constantly on guard in every case.

CASE REPORT

I.K., male, aged 10 years, of Jewish parentage.

Complaints.—Cough, fever, sore eyes and mouth, rash.

Family history.—Father has an emphysematous chest with a strong suggestion of asthma at times. Mother had had a moderate degree of pulmonary tuberculosis about eight years before. Sister had eczema in infancy.

Personal history.—Normal birth with no difficulties—measles, German measles, whooping-cough, scarlet fever, and occasional colds and tonsillitis, until tonsillectomy in June, 1940. Patient had eczema which began shortly after birth, while breast feeding, and cleared before six months old, excepting for the scalp. Had several negative tuberculin tests, the last, on February 2, 1941. No skin disease except for some impetigo a few years ago. No history of having taken any sulfonamides, prior to present illness.

Present illness.—On November 7, the boy came home in the afternoon and complained of a headache and cough. He was put to bed, given an aspirin tablet, and some syrup of cocillana, and the family physician was called in to see him, the following morning. The signs were those of an upper respiratory infection and in a day or two broncho-pneumonia developed with a temperature of 104°. He was given sulfathiazole gr. 7½ every four hours and large amounts of fluid. The day after this was begun he developed soreness of the mouth and eyes. The temperature remained at 101°. He was given syrup of citronin plus added codeine and told to continue with grains 7½ sulfathiazole every four hours, and sodium perborate was also given as a mouth wash.

The next day, November 15, the child's mouth showed large vesicles and there were numerous discrete pemphigoid bullæ on his body. Temperature was 103°. He was then hospitalized.

November 16.—Rash has developed on the body and face, starting as a multiform erythema varying in size from a pea to a silver dollar, irregular in shape. On both knees it has the appearance of a purpura, and size about 4 inches by 2 inches. There are blebs on many of the smaller erythematous areas. The skin of eyelids has blebs, as well as face and body. There is moderately severe conjunctivitis. The mouth shows thick swollen lips covered with sordes. Tongue and buccal mucous membranes covered by a dirty grey slough;



swelling of throat interferes with swallowing. It was now felt that this was a severe allergic reaction to sulfathiazole, and the drug was stopped.

November 17.—Patient much the same except that rash has spread, involving the whole body, and he is becoming more toxic. Intravenous fluids were given and arrangements made for a transfusion. The typing of his blood however was unsatisfactory, because of clumping. It was found that the patient's blood contained isoagglutinins which clumped all red blood cells, even his own. It was possible that we might have gone ahead and given small blood transfusions, as the dilutions would have been great enough not to do any harm. However, he was so ill that we did not want to run the risk of any embolic reactions from this source. Blood sulfathiazole level was only 3 mgm. %. The blood count showed 11,000 white blood cells, with 70% polymorphonuclears. Temperature ranged from 104 to 102 degrees.

November 18.—Becoming more toxic and delirious. There is no let-up in skin reaction. More new erythematous and bullous areas forming. No change in mouth condition. Patient is beginning to show twitching of arms and legs. He can be roused, but is much less co-operative. There is no change in the lung findings.

November 20.—Patient very irritable, needs constant restraining. Temperature 99 to 103 degrees. There is no anuria, but he has difficulty in voiding at first due to a bleb and ulcer at meatus, which is now improving. The blood is beginning to show a fall in white cells to 9,200 with 67% polymorphonuclears.

November 22.—Expectorating a great deal of thick tenacious mucopurulent material. Skin is showing signs of drying; unbroken blebs, umbilicated. Only an occasional new bleb now forms.

November 24.—White blood count down to 4,600 with 40% polymorphonuclears, 2% eosinophiles. Temperature range, 104 to 103 degrees.

November 25.—Breathing becoming more laboured, necessitating oxygen. Some new blebs forming, filled

with serous fluid, others cloudy, as if purulent. Blood culture shows streptococci.

November 26.—Patient expired with cardiac failure.

The ophthalmological report had been as follows: "Disc margins sharp and distinct. No evidence of toxic neuritis. He has an anterior uveitis which shows as many white dotted areas scattered throughout the fundi. This is toxic in origin."

Other laboratory reports were: blood protein 4.25 gm. per 100 c.c. blood; blood chloride 396 mgm. per 100 c.c. blood; urine negative throughout excepting a faint trace of albumin, on the day of death. Blood.—Other than white cells. Hemoglobin down from 95 to 75%; red blood cells down from 4.5 to 4.2 m. Racial and familial objections prevented the performing of an autopsy.

CONCLUSION AND SUMMARY

A 10-year old boy, with an allergic history, was given accepted therapeutic dosages of sulfathiazole. Twenty-four hours later, he developed signs locally and constitutionally, especially in skin and mucous membranes, later a neutropenia; his blood contained isoagglutinins which prevented giving a transfusion. He expired on the 12th day from overwhelming toxæmia.

This is undoubtedly a sensitization to sulfathiazole. The skin lesions were most probably a focal necrosis.

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During the war many experiments have been made to discover the best medium for vitamins and allied accessory food factors. Biscuits, sweets, various "spreads", and chocolate have been tried, and it has been found that the last is best, possibly because cocoa butter seems to inhibit loss of potency of the vitamins. Big stocks of vitaminized chocolate are therefore being built up in readiness for distribution in European countries as and when they are freed. The chocolate is being made in 1-oz. bars, each of which will provide the greater part of a day's requirements of vitamins A, B, C, and D. Their efficacy has already been proved in Malta where they were given to children as a result of observations of the state of the nutrition of the garrison made by Professor J. C. Drummond, scientific adviser to the Ministry of Food. In European countries supplies will be used in particular for the benefit of children aged 7 to 14 years.—*J. Roy. Inst. Pub. Health & Hyg.*, 1943, 6: 192.

Clinical and Laboratory Notes

PHARMACOPŒIAL STANDARDS

A Report

A milestone of progress was passed by the Canadian Committee on Pharmacopœial Standards at its second meeting in Ottawa on June 11 and 12, when the list of items to be included in the new Canadian Supplement in the British Pharmacopœia was approved. Furthermore, the principle was established of assigning official proper names to drugs both outside, as well as inside, the Pharmacopœia, and requiring such names to appear on the label as conspicuously as any other name. Thus a product with a half dozen different trade names will always be recognized by its proper official name.

The Committee was established last year for the purpose of advising the Department of Pensions and National Health with regard to any modifications to the British Pharmacopœia which are considered necessary in the public interest, and also to advise the Department with regard to regulations proposed to be made under Section 6 of the Food and Drugs Act with respect to any drug included or to be included in Schedule B of the said Act.

There was a heavy agenda, in which numerous topics came up for quite detailed consideration, and the Committee did well in completing its labours in a day and a half. Liaison had been established with the British Pharmacopœia Commission and the Committee of Revision of the United States Pharmacopœia with assurances that the fullest co-operation might be anticipated.

The sub-committee, under the convenership of Professor V. E. Henderson, had given extensive study to what items should be included in the new Canadian Supplement, and also to the coining of suitable proper names. Thus for example, Tetracaine Hydrochloride was decided upon as the proper name for Decicain, Pontocaine, Butethanol, and Amethocaine; and Acetylsalicylic Acid as the proper name for Aspirin.

It was understood that the Canadian Formulary was likely to be continued in a new and enlarged form. It would consist of the three sections as before. The possible advent of National Health Insurance left some doubt as to what would be expected of the Formulary section, but it was anticipated that it would be extended. The Canadian Formulary proper (including the old Addendum section) would contain drugs which warrant some recognition, but which are not sufficiently important to be included in the Canadian Supplement. It was also stated that the Canadian Pharmaceutical Association was anxious to amplify the Reference companion section of the book.

Monographs for many items contemplated for inclusion in the new supplement to the British Pharmacopœia had been drafted and were circu-

lated as a basis for discussion. The Committee studied them individually and approved of the list given below. In considering the contents, it was felt that only articles in general use should be described, and it was recommended to the British Pharmacopœia Commission that drugs used only locally should not find a place in what was a standard book for the whole British Empire. For example, remedies for tropical diseases should be admitted with caution. The present difficulties with regard to supplies of vegetable oil resulted in a decision to recommend that camphorated oil be made with any good quality vegetable oil, the iodine value of which was below 135, and the freezing point below 0° C. Colouring substances were to be introduced which would enable the pharmacist to impart any shade of colour in a preparation from purple blue to red. A new formula for Easton's Syrup has been devised from which quinine has been omitted, but owing to a marked difference of opinion throughout the trade no decision was reached regarding a revised monograph for liquor arsenicalis. The standard for thyroid was also reviewed in the light of representations that had been brought up by manufacturers, and it was agreed to be in the best interests of all concerned that thyroid should be understood to be dry thyroid, and that it should contain 0.3% of thyroid iodine.

It is anticipated that final approval will be given at the next meeting at the end of September of the manuscript of the now completed supplement to the British Pharmacopœia.

The Committee debated at length whether it would be better to provide individual standards for tablets and capsules, and considered a draft regulation prepared by the chairman and secretary for controlling the variability of the actual medicinal content. The regulation proposed to set up an umbrella to cover all tablets except such as experience proved should be dealt with individually. In principle, the percentage of variability would be inversely proportional to the amount of medication. Thus a 5-grain tablet would be allowed a 6% margin of error, but a 1/100 grain tablet would be permitted a 10% margin. In view of difficulties arising from possible exceptions to the rule, a sub-committee was appointed to consult with the trade and re-draft the order, making provision for numerous exceptions.

The sale of white discoid mercuric chloride tablets in ordinary white glass bottles came in for censure. The Committee recommended that such tablets should always be coloured, that they should be of a different shape from ordinary tablets, and that they should be marketed in bottles readily distinguishable by touch.

Methods of standardizing sex hormones, standards for liver extract and new arsenicals were also discussed at length, and the Committee was unanimous in endorsing the existing order limiting the sale of sulpha drugs in internal remedies for human use to prescription only.

PROPOSED LIST OF ARTICLES TO BE INCLUDED IN
THE CANADIAN SUPPLEMENT

Acidum Nicotinicum
Acidum Phosphoricum
Concentratum
Alcohol
Tribromethylicum
Amaranthum
Amyleni Hydras
Benzylis Benzoas
Benzoinum
Bromethol
Butacinae Sulfas
Ceruleum Nitens
(Brilliant Blue)
Cyclopropanum
Diphenylhydantoinum
Solubile

Dithranol
Ephedrina Sicca
Hexobarbitonum Solubile
Liquor Hydrogenii
Peroxidi
Menaphthonum
Morphinae sulphas
Neostigmina Bromide
Neostigmina Methyl-
Sulphonas
Nicotinamidum
Nikethamidum
Nitrogenii Monoxidum
Estradiolis Benzoas

Cestronum
Oleum Cassiae
Oleum Coccois
Oleum Hippoglossi
Oleum Maydis
Paraffinum Liquidum
Leve
Pentobarbitonum
Solubile
Rubrum Cumidinum
(Ponceau-3R)
Riboflavina
Sapo Durus
Sapo Mollis
Secnonum
Stilbestrol
Stillbestrolis
Dipropionas

Sulfadiazine
Sulfamilamidum
Sulfapyridina
Sulfapyridina Solubilis
Sulfathiazolum
Sulfathiazolum Solubile
Syrupus Ferri Phosphatis
Cum Strychnina
Tartrazina
Tetracaina
Hydrochloride
Thiamina
Hydrochloridum
Thyroideum Siccum
Thyroxinum
Unguentum Hydrargyri
Unguentum Hydrargyri
Dilutum

Editorial

THE PREVENTION OF RHEUMATIC FEVER

AS one studies the childhood disease rheumatic fever one is struck more and more by two factors; (a) its "social" implications, (b) its "family" relationship. Socially, the disease appears in a definite economic group in the community and appears to remain definitely in that group; not in the destitute, and rarely among the well-to-do, and in most communities it is definitely not a disease of private, as distinct from hospital, practice. While it is admittedly a disease of children and should be seen in the practice of those confining their work to diseases of children, few such men experience the disease in their private work, though it is common in hospital work.

It would seem, therefore, that the social aspects have much to do with its frequency. Many years ago the Royal Commission in England showed an apparent relationship to climate, housing and dampness. Experience in this country would strongly suggest that these factors may also play a part here, and that the social group who acquire the disease here are badly housed and overcrowded, with the well recognized increase in infection rates—including those with the hæmolytic streptococcus—associated with inadequate housing facilities. The prevention of rheumatic disease from this point of view, is then a social and economic problem, rather than a medical or immunological one.

Recent suggestive work by Coburn, (*American Journal Diseases of Children*,

May, 1943) on the possible relation of dietary factors to the occurrence or re-activations of rheumatic disease is, in this connection, of extreme importance. His findings support the probability that certain dietary insufficiencies, notably in protein, iron, calcium, and vitamin A, singly, but usually in combination, may bear a definite relationship to susceptibility to this disease. Such a relationship is suggested, but not claimed. The possibility becomes of even greater interest when one considers the frequency of rheumatic fever as a family disease. If the family unit, all exposed to the same housing conditions, the same frequency of infections with hæmolytic streptococcus, or other organisms, and subsisting on a diet lacking in the same types of food factors, develop a specific disease, it seems possible that some of the answers to the problem of rheumatism may soon be answered. Cheadle's conception of the "rheumatic soil" as an explanation, may be quite correct, if "soil" be considered the human framework, conditioned by diet, infection and environment.

Such conclusions, if justified by later work, suggest that the prevention of rheumatic fever is a social-economic problem possible of solution by better housing, with relief of overcrowding, and diminished frequency of infections, together with improved knowledge of nutrition by the public. The educated social group, adequately housed, is in no danger of deficient dietary intake of calories, protein, vitamin A, calcium and iron, but many working class groups do

live on such diets, do live in inadequate houses, and do live more than "one to a room".

Even as the prevention of tuberculosis is a social-economic problem, so more and more it would seem is the rheumatism prevention problem. The sooner we can provide adequate housing and proper nutrition for the economically necessitous groups, the sooner will the problem of rheumatic disease be solved. Already a body of knowledge is coming to light on the basis of which it may be possible to solve this problem, even though the definitive proof of its etiological factors is not yet established. From the public health viewpoint, it would seem entirely logical that rheumatic fever be made a "reportable" disease. In spite of the above suggestions, we recognize that under certain conditions, rheumatic fever has some characteristics of an epidemic infection, *i.e.*, among young soldiers in crowded barracks—following epidemic sore throat—though adequately nourished. However, if it were made a reportable disease, and the public health authorities were encouraged to regard the disease as a social and a nutritional problem, as well as a problem in immunity or infection—truly "preventive medicine"—a body of factual knowledge would rapidly develop concerning control of the disease and its prevention. The new "social" medicine will, possibly, achieve this viewpoint, and actually "prevent" rheumatic fever.

R. R. STRUTHERS

Editorial Comments

Present Status of Health Insurance Legislation

With the adjournment of the House of Commons this summer there has naturally been a temporary cessation of discussion on Health Insurance legislation. The Special Committee on Social Security had before the close of the session submitted an interim report which reads in part as follows:

"The Committee recommends:

1. That before the Bill is approved in detail or amended and finally reported, full information regarding its provisions be made available to all the Provinces.

2. That to provide this information, officials of the various government departments concerned be instructed to visit the various Provinces and to give full details of the proposed legislation to the Provincial authorities.

3. That, if possible, before the next session of Parliament, a conference of representatives of the Governments of the various Provinces and the Dominion be held to discuss certain complex problems involved, especially financial and constitutional questions.

4. That in the light of all the information meanwhile obtained, study of the Bill be continued by a committee of the House and by the Advisory Committee on Health Insurance.

5. That the Government review the existing regulations governing Old Age Pensions, Pensions for the Blind, and War Veterans' allowance, and consider the advisability of adjusting the eligibility age to a lower level and of increasing the amount of pension.

6. That an investigation be made into conditions and bases of grants of these pensions in the various Provinces, cost of subsistence, inequalities, responsibility for and distribution of obligation, and all the matters relating to the problems involved, in order to effect greater co-ordination, equality and adequate adjustments.

7. That a study of a program of Social Security be continued during the next session of Parliament, with the object of making a co-ordinated framework of the various topics and problems.

8. That this Committee, or the Committee subsequently appointed to consider Social Security, be provided with necessary research assistance."

It will be seen therefore that at the next session the subject will be again taken up. It behooves our profession to keep the matter steadily in mind and to be ready to put forward its views clearly and firmly. We must be prepared for the time when action will be substituted for discussion.

Enteric Group Fevers in Prisoners of War from the Western Desert

From the beginning of the North African campaign in 1940 it was known to us that fevers of the enteric group were of common occurrence amongst the Italian troops (J. S. K. Boyd, *Brit. M. J.*, June 12, 1943). Further evidence of this appeared with the first large numbers of prisoners taken. These were so numerous that for some time the sanitation in their camps was very primitive, and, as Colonel Boyd adds, "the complete lack of sanitary conscience which is common to the Latin races made control a matter of very considerable difficulty". However, by great effort and rigid sanitary discipline, only a small wave of typhoid occurred. This was in January, 1941, and it was soon controlled. With the summer months however more cases appeared and by June a major epidemic was in progress, and it did not cease until September.

The striking feature of this episode is that almost as soon as the prisoners had been captured in January steps were taken to ensure their inoculation. Those who could not prove that they had been inoculated within two years were given two doses of vaccine. All others were given one dose. These precautions were repeated in June, when it was evident that an epidemic was imminent in spite of these inoculations. The significant point is that it was Italian vaccine which was used. Large quan-

tities of this had been captured, and there was not enough British Army T.A.B. vaccine to meet such heavy demands. When, however the British Army vaccine became available in August, 1941, inoculation with it was carried out, and following on this, but not necessarily on account of it, the outbreak rapidly waned.

More proof of the prevalence of typhoid amongst army troops was found in a captured hospital at Mersa Matruh, which contained two wards—one of Italians and one of Germans—full of enteric fever. Amongst our own troops who became prisoners of war, there is definite proof that in spite of their being confined in large numbers in camps under poor sanitary conditions, and during months when typhoid was at its height (June to October) there was practically none of the disease at all.

The Italian vaccine was tested in parallel with the British vaccine by the mouse protection test. This showed that whilst the British vaccine was of the normal standard potency the Italian vaccine showed only a limited protective power.

This fact bears out the conclusion that the protection of the British troops against typhoid is relatively complete, whilst the Italian vaccine both experimentally and clinically fails to give adequate protection. The German vaccine has not yet been tested experimentally. Someone seems to have let the Duce down.

Canadian Life Insurance Officers Association

The Canadian Life Insurance Officers Association presented a Submission to the Special Committee on Social Security last winter. This Submission has now been printed in the form of a pamphlet entitled "Public Health and Health Insurance". It contains sound study of the problem of Health Insurance and careful analysis of the proposed Draft Act dealing with it.

Copies of this Submission may be had on application to the Secretary of the Association, 302 Bay Street, Toronto.

"The available evidence suggests that raised arterial pressure in essential hypertension is due to arteriolar constriction, and that this constriction probably affects the vessels to voluntary muscle little if at all; while in the skin vessels, and probably also in the cerebral vessels, its degree is just great enough to counter the effects on blood-flow of raised arterial pressure. In the kidney the efferent glomerular arterioles are constricted, and this narrowing is great enough to reduce the renal blood-flow. Finally, there is evidence, both from the skin and from the kidney, that the agent is not nervous but chemical."—G. W. Pickering, The circulation in arterial hypertension, *Brit. M. J.*, July 3, 1943.

Medical Economics

IMPLICATIONS OF HEALTH INSURANCE BASED ON ACTUAL EXPERIENCE

By J. A. Hannah, B.A., M.D.

*Managing Director of
Associated Medical Services Incorporated*

Further to our brief discussion of this problem appearing in this *Journal* under date of June, 1943, we are presenting further information based on our six years' experience in the problem of budgeting the cost of medical care. In presenting the following tables, it must be remembered that A.M.S. has had to build up from scratch. At the outset there were neither the finances nor the experience on which to take off any statistics. Funds for this purpose are still limited, but we are at the present time securing fairly adequate statistics at a minimum of cost by securing them as a by-product of our daily routine. May we state, however, that if and when funds are available for a fuller study and equipment, we have all the necessary documents from which to make such studies.

NUMERICAL GROWTH OF A.M.S.

Table I indicates the growth in numbers and finances of A.M.S. since its inception on June 1, 1937—the date on which the first subscriber was received. The table tells its own story and we shall not comment further.

Table II shows the average monthly cost per subscriber by services from 1939 to the end of 1942.

Although the figures need no comment, there is a word of warning which should accompany them. Any cost figures are largely dependent on management. No organization can remain solvent unless the management makes it a definite responsibility to see that basic principles are observed. A.M.S. has at times been subject to criticisms, and on one occasion in five years' experience, sought a court decision in order to prevent undue and unfair services becoming a responsibility. By virtue of such an attitude, A.M.S. has been able to retain its original good intentions for the majority of its subscribers against the attempted pilfering by a few.

It matters little how good intentions may be, if by such good intentions, the solvency of the organization may be threatened—"If the heart governs the head, both will be buried together". It can, however, be proved by our records that A.M.S. does "temper justice with mercy" where there may be reasonable room for doubt.

Table III shows the income of wage earners in our subscribers in relation to number of dependents. This table indicates that A.M.S. is fulfilling its objectives for our subscribers, *viz.*, to permit the average wage earner to budget against the cost of illness having its origin in

TABLE I.

Year	Number of subscribers	Total earned income	Income for payment of medical accounts	Medical payments	Addition to Medical Reserve	Total Medical Reserve	% of total income used for administration
1937	733	\$ 4,534	\$ 2,059	\$ 337	\$ 1,722	\$ 1,722	....
1938	4,024	47,895	30,962	21,340	9,622	11,344	35.2
1939	12,762	172,531	127,572	109,699	17,873	29,217	24.6
1940	22,267	402,182	306,530	267,509	39,021	68,238	21.1
1941	28,612	577,910	461,705	432,062	29,643	97,881	19.8
1942	30,811	690,206	561,969	547,433	14,535	112,416	17.6

TABLE II.
MEDICAL COSTS PER SUBSCRIBER

Year	Hospitalization	% of total	Drs.' Fees	% of total	Nursing	% of total	Total
1939	.35c	23.0	\$1.08	71.0	.09c	6.0	\$1.52
1940	.37c	25.0	1.03	70.0	.07c	5.0	1.47
1941	.41c	26.0	1.09	69.0	.06c	5.0	1.56
1942	.41c	28.0	1.06	70.0	.03c	2.0	1.50

the future. It is to be noted, particularly, that 93.3% of our subscribers have incomes of less than \$3,000. Indeed, roughly 80% have incomes of less than \$2,000, the group in which the cost of illness constitutes a serious problem.

It is true that very few with incomes of less than \$1,000 have dependents. We have always known that the indigent and low income group could not be handled by A.M.S. unless some

brought under the application of the insurance principle if all members of the community share all the cost, irrespective of age, sex, or marital status. Further, the cost of illness is much more closely related to the family unit and income than to any element of employment.

It is for this reason that A.M.S. has always collected a uniform rate of subscription, irrespective of any discriminating factor. We are well aware that big business is possible only on the basis of excluding the more expensive illness in the community. A.M.S. might have been much larger in numbers had we had a special plan for employed groups only, and thus excluded the most expensive service we cover, *viz.*, childbirth. Our interests have never been identified with big business, hence our smaller number of subscribers with a broader service. Neither have we been unaware of our greatest weakness which is common to any voluntary

TABLE III.
ASSOCIATED MEDICAL SERVICES, INCORPORATED
INCOME GROUPINGS—WAGE EARNERS BASED ON APPLICATIONS RECEIVED DURING THE YEAR 1942

Income	Dependents							Total	Percentages	
	0	1	2	3	4	5	5+			
Under \$1,000.....	1,020	49	9	2	1	0	0	1,081	28.4	
\$1,000 to \$1,999....	1,242	549	85	13	7	2	0	1,898	49.9	78.3
\$2,000 to \$2,999....	182	268	94	24	4	0	0	572	15.0	93.3
\$3,000 to \$3,999....	35	66	55	18	4	0	0	178	4.7	98.0
\$4,000 to \$4,999....	9	14	17	9	3	1	0	53	1.4	99.4
Over \$5,000.....	0	3	1	3	0	0	0	7	0.2	99.6
Not stated.....	10	1	1	1	1	0	0	14	0.4	100.0
Total.....	2,498	950	262	70	20	3	0	3,803		
Percentages.....	65.7	24.9	6.9	1.8	0.6	0.1				

source of subsidy is forthcoming. If, however, either the employer or the Government or both should render some assistance, we believe the whole system could be handled more economically and satisfactorily than through a Government-controlled plan. At least A.M.S. has been free of the political pressure which might be exercised when undue or improper services are demanded. In our opinion, pressure of any type constitutes the most serious threat to the solvency of any plan.

WHO RECEIVES THE SERVICES?

From its inception, A.M.S. has insisted on the principle that the cost of illness can only be

plan attempting to provide a complete service. No such voluntary organization is able to take on illness which existed at or had its origin prior to the date of application. Otherwise, such a plan would be overloaded with expense for conditions against which no reserve has been established or funds collected.

On the other hand, if all contribute, we are of the opinion that it would be possible to conduct such a plan without exclusion either in regard to conditions of health or individuals. Further, we are convinced that under such a system the subscription collected could be materially reduced to the advantage of the public and profession alike.

Despite the fact that A.M.S. has maintained a uniform subscription, we have been interested and have secured for the year 1942, the distribution of our costs according to age group, sex, and marital status. Table IV gives these costs in total amount.

From Table IV it becomes obvious that child-birth is a heavy load on any fund. From the financial point of view, the cost of this and other groups constitute a load which can only be handled by distribution of the cost on a broad basis. They are the items of cost against

"imaginary illness" and necessary minor medical care.

A survey of the months of February, 1941, and November, 1942, revealed the fact that 66% of our accounts in those months were in the sums of less than \$6.00. The total cost of these items approximated 35% of our total outlay. From the diagnoses given and a review of the history cards of those receiving the service, we are led to conclude that many such services were for imaginary conditions. Even in those cases where the service was essential, the costs

TABLE IV.

ASSOCIATED MEDICAL SERVICES COSTS BY AGE GROUPS, MARITAL STATUS AND SEX,
FEBRUARY TO DECEMBER INCLUSIVE, 1942

	Single		Married		Others	
	Male	Female	Male	Female	Male	Female
Under 1 year.....	\$ 703	\$ 489	....	....	....	....
1 to 2 years.....	10,193	8,726	....	....	....	....
3 to 6 years.....	13,882	10,176	....	....	....	....
7 to 16 years.....	17,613	13,080	....	....	....	....
17 to 24 years.....	4,287	11,523	\$ 696	\$ 15,266	\$ 13	\$ 816
25 to 35 years.....	4,703	26,124	31,261	158,038	114	4,174
36 to 45 years.....	1,837	20,905	17,662	36,091	122	4,406
46 to 55 years.....	2,761	16,790	10,014	13,986	167	3,389
56 to 64 years.....	2,609	5,114	6,262	6,114	....	341
65 years and over....	408	570	147	556	....	....

which budgeting is most needed by the public.

The gravest danger to any plan whether non-profit, private or Government-controlled, lies in the individual (whether male or female, old or young) who continually draws service for imaginary conditions or indeed conditions for which the individuals would not see their physician if the expense were borne personally. Please note that we have distinguished between

would not constitute a serious financial obligation on the family resources, and might be less expensive if handled by the family directly on some form of deductible scheme. Certainly, it would eliminate a great deal of administrative expense and unwarranted medical cost.

Table V shows the ratio of expenditures in regard to the main divisions of classification of diseases for the years 1940 and 1942. It is self-explanatory and needs no further comment.

Table VI shows a breakdown of the moneys

TABLE V.

STATEMENT OF MEDICAL EXPENDITURES
BY SYSTEMS AND SERVICES

SYSTEMS	1940		1942	
	Amount	%	Amount	%
1. Infections.....	\$ 10,628.11	4.2	\$ 21,840.33	4.0
2. Cancer, etc....	8,109.63	3.2	15,260.35	2.7
3. Rheumatic.....	6,379.10	2.5	16,948.77	3.1
4. Blood, etc.....	2,188.25	0.8	5,642.68	1.3
5. Poisoning.....	....	..	88.00	..
6. Nervous System.....	13,756.85	5.4	31,666.66	5.8
7. Circulatory....	5,137.98	2.1	14,509.39	2.6
8. Respiratory....	22,458.31	9.0	50,582.07	9.2
9. Digestive.....	51,680.13	20.5	110,841.80	20.2
10. Genito-urinary.	17,233.38	6.9	45,914.64	8.4
11. Childbirth....	50,420.96	20.0	144,431.21	26.4
12. Skin and Tissue	8,919.05	3.5	18,683.27	3.4
13. Bones, etc....	2,742.50	1.1	9,421.77	1.7
14. Malformations.	2.00	..	194.25	..
15. Early Infancy	1,159.00	0.4	2,582.35	0.4
17. Accidents.....	17,208.72	6.8	32,105.55	5.9
18. Ill-defined....	31,106.04	12.4	19,698.06	3.6
19. Preventive....	3,117.75	1.2	7,022.62	1.3
	\$252,247.76		\$547,433.77	

TABLE VI.

SERVICES	1940		1942	
	Amount	%	Amount	%
1. Home calls....	\$ 35,634.90	14.1	\$ 70,825.40	13.0
2. Office calls....	52,743.30	21.0	102,739.30	18.7
3. Hospital calls..	5,268.30	2.1	9,700.75	1.8
4. Consultations..	5,588.35	2.2	10,465.25	1.9
5. Surgery.....	37,550.50	15.0	97,178.07	17.8
6. Obstetrics....	20,779.25	8.2	54,428.25	9.9
7. Refractions....	1,140.71	0.4	5,272.00	1.0
11. Drugs (in hospital)....	1,460.83	0.6	2,648.69	0.5
12. Anaesthesia....	6,522.35	2.5	20,182.42	3.7
13. Laboratory....	3,107.03	1.2	5,389.38	1.0
14. Operating room	7,948.86	3.2	12,748.50	2.3
15. Therapy.....	1,873.75	0.7	647.00	0.1
16. X-ray.....	8,361.90	3.3	15,449.60	2.8
17. Treatments....	1,138.44	0.4	8,702.45	1.6
18. Diagnostic aids	1,331.65	0.5	6,207.00	1.1
20. Hospital extras	....	..	6,619.38	1.2
21. Nursing.....	12,719.90	5.1	9,549.02	1.7
22. Hospitalization	49,077.74	19.5	108,681.31	19.9
	\$252,247.76		\$547,433.77	

spent as in Table V, in regard to the various types of service. It also needs no further comment, except to point out the extent of the services for which we pay.

Table VII shows the rate of subscription charged by A.M.S. on a family group basis and is the only source of income to cover the cost of the services as indicated in Table VI.

TABLE VII.
SUBSCRIPTION RATES

	Monthly
Single subscriber (17 years of age and over).....	\$2.00
FAMILY GROUP:	
Husband and wife.....	3.75
Husband and wife (both employed).....	4.00
Husband, wife and 1 dependent under 17 years...	5.25
Husband, wife and 2 dependents under 17 years...	6.50
For each additional dependent under 17 years....	1.00
Dependent children over the age of 17 years.....	2.00

Table VIII is an analysis of how our accounts have been paid. Part 3 of Table VIII indicates the various reasons for reduction of accounts.

TABLE VIII.

ANALYSIS OF CLAIMS SUBMITTED BY AND PAYMENTS MADE TO PARTICIPATING DOCTORS OF A.M.S. FOR THE MONTHS OF *FEBRUARY, JULY AND NOVEMBER, 1941.

		%
1. Total amount paid as claimed....	\$57,982.45	89
Total amount reduced.....	2,905.75	4
Total amount held for further consideration.....	4,099.00	7
Total amount claimed.....	\$64,987.20	100
2. Number of accounts paid as rendered...	8,805	92
Number of accounts reduced.....	555	6
Number of accounts held for further consideration.....	218	2
Number of accounts rendered.....	9,578	100
3. Analysis of accounts reduced:		
(a) To adhere to O.M.A. schedule.....	175	31
(b) To conform with A.M.S. allowance.....	193	35
(c) Accounts previously paid.....	74	13
(d) Subscriber not eligible for service....	21	4
(e) Not A.M.S. responsibility.....	92	17
	555	100

*For service rendered in January, June and October.

The only comment necessary in regard to this table is to say that the payment of from 93 to 95% of accounts just as received from the doctors is indicative in some measure of the co-operation possible from both public and profession under controlled supervision. It does not follow that such co-operation will be forthcoming from either profession or public under a system in which the finances are not so obviously a direct charge against the subscriber. Indeed presentations which we have so far studied suggest that everyone is interested in getting as much as possible both by way of service and monetary return.

A MILITARY "HEALTH CENTRE"

By Captain Glen F. Hamilton, R.C.A.M.C.

The Overseas Bulletin No. 1 (December, 1942) invited comment from medical men overseas. Although the remarks made here may only be obliquely pertinent, still, it is hoped someone may derive a few reflections from them.

There is a good deal of speculation, particularly in the United Kingdom, about "Health Centres". I believe that in the Medical Inspection Room at Canadian Military Headquarters we have a military counterpart to such an establishment.

The Supplement to *The British Medical Journal* of May 8, 1943, contains an interesting note on the "Health Centre" by the Sheffield Discussion Group; I quote in part:

General practice should be carried out from health centres, each of which should cover a population of approximately 15,000 and be staffed by about ten doctors working in close collaboration, thus providing a rota for night calls and opportunities for holidays and visits to other medical centres. The health centres should be co-ordinated with the hospitals in the regionalization scheme, thus eliminating unskilled specialization in group practices and small town hospitals. Public health personnel and services should be unified with general practitioners in health centres, and the Centre doctor encouraged to do some of the medical work now taken over by the public health departments, provided he had undertaken special training. Doctors should be appointed to the centres by regional medical authority on the basis of ability, and paid a basic salary in addition to a capitation fee for each patient attracted up to a maximum of 2,000.

A clerical staff would deal with all financial matters and be responsible for a well kept system of records, filed and analyzed, thus facilitating the work of locum tenentes and stimulating interest in investigations and follow-up inquiries. The principle of free choice of doctor should be maintained.

Here, at Canadian Military Headquarters, the military population is more or less static and consists of a large number of people ranging from the "gilded staff" down to the clerks and drivers. We are gradually, too, acquiring more C.W.A.C.'s so that the female side is also well represented. While admittedly dealing with a selected group of personnel coming within certain age limits, about the only branch of medicine not met with is paediatrics.

For security reasons the total numbers cannot be stated, but some rough idea may be gained from the fact that three medical officers are employed, of whom the senior acts chiefly in an administrative capacity. There are two orderlies with the day medical officer and one orderly with the night M.O. The hours are, day 0900 to 1800, and night 1800 to 0900. These are maintained for a fortnight when a change of shifts takes place. A rota system ensures two out of three weekends free from duties.

A central location houses the "M.I. Room" which consists of a large well-equipped office with all the gadgets dear to the heart of the G.P., a dispensary—"sick-bay" (for overnight

admissions only), waiting room, and M.O.'s office where the night M.O. sleeps, as well as a staff-cum-clerical room.

Rolling stock consists of two ambulances and staff-cars available as needed on 24 hour call.

The "population" treated live for the most part in billets of their own choosing. This is an important differential point, as all other large bodies of troops in this country live in barracks or billets under constant supervision. C.M.H.Q. personnel therefore more or less approximate a civilian type of existence. Many or them are married, so when one makes a house call on personnel "S.I.Q." (Sick in Quarters) it's just like old times to be greeted at the door by an anxious wife! A large additional floating population consists of troops on leave in Headquarters area, R.C. Navy and Canadian Merchant Marine personnel. House calls are performed if necessary up to a radius of ten miles.

Sick parade is held from 0900 hours each morning till noon and one sees all manner of complaints, errors of refraction, acute urethritis, sprained wrists, impetigo, painful flat feet, arthritis, bronchitis, paronychia, etc., etc. Afternoons are devoted to medical boards, immunizations, anti-luetic treatments and casual sickness. Road, "pub", and blackout accidents are frequent, and an ambulance or staff car is constantly in demand. Many of these accidents of course are taken by the police to a "civvy" hospital before we hear of them, but when fit for transfer, are moved to a Canadian General Hospital.

The worthy features of this "Health Centre" are I think, obvious;

1. A 24 hour G.P. service on hand.
2. Through liaison with Canadian General Hospitals and British civilian hospitals all specialist services are easily available, E.E.N. & T., surgical, medical, neurological, gynaecological, psychiatric, dermatological, etc.
3. Early and adequate treatment. If it's only "acute coryza" one can diagnose with one hand and give the appropriate medication with the other. (A good point from any view is that in the army one can order an acutely transmissible head-cold home for 2 or 3 days). If it is an acute appendix there is no delay in the transport and treatment.
4. Effective "follow-up" of lengthy cases. No man can "live unto himself" in the army. Luetic or Neisserian infections receive adequate care and after-treatment whether they will or no. "Head cases" are followed up efficiently for months on the pro-forma from No. 1 Neurological Hospital. TB. contacts have a patient, watchful eye on them wherever they may go.

From the M.O.'s viewpoint one can mention regular hours and sleepful nights, opportunities for study courses, and, in addition,—and I

believe quite important—regular holidays free from worry about "getting back".

After three years as an ordinary rank and file M.O., I believe that the much touted "free choice" of doctor is highly over-rated. Most men in the army have every confidence in whatever M.O. they meet, and one feels that trust has been justified. Perhaps some few are more concerned with the pips on their shoulders than sympathetic discharge of their professional duties, but these usually modify their attitude with experience.

The remarks in the quotation from the *British Medical Journal* above in regard to remuneration do not apply in this letter. Working for a salary in peace-time may or may not appeal. It is a common observation, however, that, to date, few doctors have died wealthy! And if all one's operational expenses are paid (as in the R.C.A.M.C.), a purely personal salary, small though it may appear at first glance, is often surprisingly more than one had in the "free medical world". Perhaps a pension in the offing and help in educating children would be a great help. But this is digression.

To conclude, an endeavour has been made to outline the *modus operandi* of a military medical installation of a type analogous to the possible future "General Practitioner Health Centre".

* * *

As a footnote I would like to draw attention to the large number of N.C.O.'s and other ranks in the R.C.A.M.C. who through intimate contact with medical work in the "field" and in General Hospitals have become very efficient clerks, nursing orderlies, etc. If some form of "State Medicine" or "Health Insurance" is adopted, these men are already trained to fill many posts as clerks, male nurses, drivers, technicians, etc. There would perhaps exist a far wider opportunity for them than there is today where they have a limited field usually in general and mental hospitals.

CONCOCTING A SOLDIER.—Take one young Canadian, slightly green. Stir from bed at an early hour; soak in shower or tub daily. Dress in olive drab. Mix with others of his kind. Grate on sergeant's nerves. Toughen on manœuvres. Add liberal portions of baked beans and roast beef and season with wind, rain, sand and snow. Sweeten occasionally with chocolate bars. Let smoke often. Sprinkle generously with War Savings and Victory Bonds. Bake in 90 degree temperature in summer and let cool below zero in winter. Serves 11,500,000 people.—*Alberta Med. Bull.*, July, 1943.

Men and Books

JEROME CARDAN*

By H. E. MacDermot, M.D., F.R.C.P.(C)

Montreal

There are probably few notable figures in medicine who have received so little attention in medical literature as has Jerome Cardan. A search through that indispensable institution, the *Index Medicus*, produces only a handful of references to him, and many of these, as might be expected, are in Italian journals.

It may be said that Cardan added little or nothing to our scientific knowledge of medicine, and, even if he did rise far above his contemporaries as a physician, he was never a leader in medical thought, and gave no impetus to research. But a man of such unusual mental gifts, and one whose life contained such sustained dramatic incident, should not be so casually passed by. The best studies of his life have been made by lay authors, but even outside of the profession he is not nearly so well known as is his contemporary Benvenuto Cellini, whose notoriety depends not only on his acknowledged artistic genius, but also on his unreserved confessions of deeds of violence which at this safe distance of time we are pleased to regard as romantic.

Cardan lived at a time when a physician with such intellectual powers as his, and a mind as independent, might well have dominated his profession. That he did not was due to a combination of circumstances, especially his personal qualities, but these I will not now discuss. The main features of his career will be found to be of sufficient interest in themselves. He was born in 1501, his father being a prominent lawyer in Milan, of good family, and his mother a woman of no outstanding qualities, apparently, beyond some quickness of wit and humour. For reasons which are not quite clear, his parents were never legally married, a situation which was to mean a great deal to their son. Trouble began before his birth even, abortion being twice attempted. After a three-day labour, however, he eventually came into the world, and then his troubles continued without much intermission. It required a bath of wine to keep him alive for the first few hours, after which he was put to nurse with a woman who within the month contracted plague and died. The child was also infected, and as he described it later himself, contracted a dropsy and flux of the liver, but was preserved "whether through the wrath or mercy of God I know not".

Not many men can have survived greater tribulations than did the young Jerome. The

plague was bad enough, but, as an unwanted child, his parents came almost as close to cutting short his life as it did. His mother and aunt beat him continually, so much so that of his aunt he says "I believe she herself must have been without a skin". His father helped in the flagellations. At the age of 7, however, the boy's physical condition became so wretched that the beatings were discontinued.

His father then put him to work carrying his bag of papers through the streets on his daily business, and it is a question whether this was not a greater strain on the boy than the beatings. At any rate, after a year of it he managed to develop an attack of dysentery which brought him to death's door. By this time, however, his father seems to have recognized something of value in him and not only called in two physicians but also interceded with a saint for him. This was St. Jerome, who apparently was recommended to the old man by one of his friends, much in the same way that one would recommend a good doctor. At all events, the boy recovered, and was then given his name of Jerome. "Up to my eighth year", he says later, "I had often beaten at the gates of death, but those within refused to open to me".

These proofs of physical toughness (and he was to give many more) are not what Cardan is to be remembered for. They do serve, however, to accentuate the survival of his extraordinary mental power, although they may have contributed in some degree to his later eccentricities.

From the age of eight he received better treatment at home, although he never seems, then or later, to have had any long period of tranquillity which he could recall with pleasure. He still carried his father's bag through the streets, but he was given some elementary teaching, which made up for much of his wretchedness. "I lived to myself", he tells us, "and, in some hope of future things, despised the present". He had reached the age of 19 before he was allowed to study Latin, the one language used by the educated of that time.

Some years before this, however, his aspirations took the form of writing a small book on geometry, in which his father, himself a keen mathematician, had instructed him, but the book is lost to us. His next venture into letters was a little different. At the age of 18 he was becoming intolerably restless. He was denied education; his birth was cast up against him by his companions; his health was bad, and his home uncongenial. He therefore turned his energies to gambling. What he had learned in mathematics he applied to calculating probabilities in cards and dice. His second book, not finished until he was 23, was an elaborate treatise on the science of games of chance. He makes no attempt to defend gambling; indeed, he saw and pointed out its evils. The book is interesting as an accurate picture of the games

* Read at the Seventy-third Annual Meeting of the Canadian Medical Association, Jasper Park, Alberta, June, 1942.

played in those days. Gambling was almost universal then, probably because there was such constant movement of soldiers throughout the Continent. One trick he describes is that of soaping the back of some important card, so that the others would slip from it when thrown down.

His father knew of his son's gambling. There is nothing, however, to show that he did anything to correct the vice. It was at least ironical that he should refuse for Jerome a large legacy left to the boy by a distant relative, because the would-be benefactor had been a tax-gatherer. As a result of this Spartan, if vicarious denial, the money passed to the man's brother, a Franciscan monk, who devoted it to pious uses.

However, Cardan senior realized at last that something must be done for the boy, and eventually he was sent to the University of Pavia. He was now 19, a spare, small-faced youth, with yellow hair, small, intent eyes, and a harsh voice. He had a moody irascibility, and altogether was probably not a very attractive person. At the university he began for the first time to know the happiness of fully exercising his intellectual powers. In his second year he was actually teaching Euclid, and even substituted for a short time in teaching dialectics and elementary philosophy. He worked hard, although his way of living was strictly his own. He would study all morning, then walk in the shade of the city walls. Then he dined, and after that gave up his time to music. Later in the day he would go fishing, and what pursuit could have greater attraction to one of a philosophical turn of mind! But his references to the cooking of various kinds of fish show that his interest in the sport was not all philosophical.

In the evening he would take to his gambling, but at this stage it was more of a relaxation for him than an unconquerable vice. Sometimes he would spend his time wandering through the town at night.

Apparently it was his philosophic bias which made Cardan choose medicine as a profession rather than law. Law, he said, treated of local custom, medicine, of truth common to the world and all ages. Medicine was concerned only with pure reason, with the eternal laws of nature, not the opinion of men. This choice did not meet with his father's approval at first, but age and failing health gradually softened the old man's opposition.

Whatever may be said against Cardan, and he has had some harsh critics, his charitableness towards his parents stands out as a very pleasing aspect of his nature. That he should have overcome their dislike of him was something, but it is more notable that he was never embittered against them. He does not show the least sign of recrimination in all his many references to his parents, even when he describes their ill treatment of him. Of his father he

says: "He was incorruptible and truly holy", and refers to the pitiless labour forced on him as a small boy merely as "something that at that time I thought to be hard servitude". Also, "My father appeared to me (if such a thing may be said) better and more loving than my mother". That was the most severe criticism of his mother. After his father's death he speaks of her "incredible solicitude" in supporting him at the University of Padua, whence he had gone from Pavia.

Jerome obtained his degree at the age of 25 (after being twice refused it on account of his birth), and at once began to practise in a small town called Sacco. Here he lived for the next five and a half years, and in retrospect speaks of that period of his life with a curious mixture of feelings. In one place he says:

"What with cruel vexations and struggles and cares which I saw impending, and a troublesome cough and pleurisy aggravated by copious discharge of humour, I was brought into a condition such as few men exchange for aught else but a coffin."

Further on, however, he recalls these as pleasant days:

"I gambled, I occupied myself with music, I walked abroad, I feasted, giving scant attention to my studies."

It is certain, however, that he earned very little money. He wrote copiously, and brought out a treatise on the Method of Healing, and another on The Plague, which he had abundant opportunity to observe. Two other manuscripts, one on Venereal Disease and the other on Spittle, were destroyed by the misdeeds of a cat which was not house-broken. He seems to have taken this to heart somewhat, as he speaks of it in two places. The cat was probably only one of the many animals in his house; in one place he says: "I became the owner of all sorts of little animals that became attached to me, kids, lambs, hares, rabbits, storks, so that they pollute me the whole house".

During this idle period he returned to his gambling. On one occasion, he was visiting Venice, and spent his time dicing in the house of a Venetian senator. In two successive days he lost everything to his host, and at last, finding he was being cheated, he slashed the face of his opponent with his poniard. He then took from him all the money he had lost and more, but, he naïvely remarks, finding that his dishonest host was wounded (!), gave him back some of the money and then left hurriedly.

That was not all, however. A senator, even if dishonest, was not to be wounded with impunity, and Cardan had to hide from the attentions of the police. In his wanderings about the city in the dark he slipped and fell into a canal, but was pulled aboard a passing gondola. When he turned to thank his helper, who should it be but the wounded senator, whose face by now had been bandaged. Cheat he undoubtedly was, but there must have been some element of

the sporting spirit about him, for he not only rescued Cardan, but gave him dry clothes.

Jerome married at the age of 30, but certainly not on the ground of any improvement in his fortunes. If anything, he was now in greater poverty than ever. Practice brought him in very little money. He wrote continuously, but only as an outlet for his mental energy. At his most destitute stage he began his treatise on Fate, though there was nothing to encourage him to hope that it would ever reach a printing press. He opens it with an exhortation to "All those who hope that by writing glory may possibly follow to themselves".

There had to be an end to this, however, and when he had gambled away everything he possessed, including his wife's jewels, he determined to take his family back with him to Milan, not, he said, that there was anything to seek, but there was something from which to fly. He was not permitted to practise in Milan, but at least there was a workhouse there to shelter his wife and child, and, as in every large city, there was always a chance of something turning up.

Cardan was not a man of many friends. He had a sharp tongue, he was independent, and he had the scholar's instinct for withdrawal from people. However, he had at least one good friend in Milan, Filippo Archinto, who was active in his behalf. So that eventually a small lectureship was found for him. It gave him only a pittance, but it preserved his independence, and, what was much more in his estimation, it gave him something definite on which to exercise his intellect.

All this time he had to live very sparsely, but he and his family managed to subsist on an extremely meagre diet. He writes enthusiastically on the respective merits of nasturtium leaves, rue, parsley, and other herbs, for making bread and water attractive. At all events he had little to fear from avitaminosis! But when times were better in later years he could be equally enthusiastic over more substantial fare. He was in no sense a gourmand, but he writes in great detail of what he liked. He would have a light breakfast of bread and water and raisins. Tea and coffee, of course, he knew nothing of. Dinner, too, was light, usually the yolk of an egg with some bread and perhaps a little wine. Supper was his largest meal.

His clothing gave him much less care than his food. Even when he became prosperous he cared little what he wore. In his opinion, four garments were enough for a man, one heavy and one heavier, one light and one lighter. With these, he said, he could evolve fourteen varieties of respectable apparel, with one additional gala costume when he wore them all at once! He may not have followed this plan entirely, but at any rate he had no desire for new clothes, and would go on wearing what he had until even he noticed that they needed replacement. Fashion of course was nothing to him. After

his journey to Scotland (to come later) he caused some comment amongst his neighbours by continuing to wear in Milan garments that he had bought in Edinburgh long months before. Whether it was some extraordinary tartan, or even kilts, we are not told, but at any rate the Edinburgh fashion was very different from that of Milan.

To return to his earlier days; all his writing and lecturing at this time had little to do with medicine, and, natural as it was in those days that a medical man should also be a mathematician, it was still expected that he should stick to his profession if he wished to get any practice. Jerome managed to get a few patients, and even had notable successes in treatment, but he was not really popular, and his rivals had much to criticize in him; his dicing and his absorption in philosophy and mathematics were continually cast up against him. He realized this himself after a time, and set to work to defend himself characteristically by writing a book on the bad practice of physicians of his day (*De Malo Recentiorum Medicorum Medendi Usu*). The book was not published immediately, indeed, none of his already numerous works had been printed so far, but when it did appear later on as his first venture into print it raised such a storm of protest from the profession that it did him more harm than good.

For his book was clever, and denounced many errors in practice, 72 all told. For example, he attacked the belief that there could be found one mode of cure for all diseases; and the doctrine that no patient should be bled whilst in acute pain. He even taught that to do nothing with physic was better than to do too much. Still, attractive as the book was, not to mention its soundness in many respects, the only result so far as Jerome was concerned was hard words and hostile looks from his confrères, who wanted to know how a gambler and a lecturer in mathematics could presume to teach men engaged in steady practice. There was no money in it either, for whilst the condemnation of the book was its best advertisement and led to its being much sought after, the printer alone profited, since he had assumed the risk of printing.

Recognition was very slow. The Milanese College of Physicians eventually accorded him their privileges, however and he was even appointed their Rector, but seems to have made no attempt to acquire a social standing consistent with the honour. All his time apparently was spent on gambling and on learning Greek. For over two years he spent practically every day dicing with a wealthy Milanese, who seems to have been a good loser, as Cardan always came away with winnings; indeed, he counted on them for his living.

Then his friend grew tired of it, gave up gambling, and induced Cardan to do likewise. Another extremely straitened period followed.

and eventually he was offered the chair of Medicine in the University of Pavia, which had been compelled by the never-ending wars of the period to move to Milan. When the war finally flowed away from the neighbourhood, the university went back to Pavia. Cardan had decided not to go with them, but one night, so he tells us, whilst he and his family were asleep (they were all in the one bed!) the whole house fell to pieces about them. Few men would have thought of this as more than an annoying mishap, from which they would have been glad to escape unhurt, but to him it was an omen, for he was deeply imbued with a sense of the supernatural, and he therefore went back with the university.

This was the turning point of his life. His teaching kept him steady, for he could work hard when he wanted to, and he had decided to live down the not unreasonable general belief that he knew nothing but mathematics and astrology. In this he was entirely successful. There can be no better commentary on his inherent powers than the rapidity with which his fame now developed. One after the other there came to him offers of great fees and salaries if he would attach himself to the courts of the great. The King of Denmark, for instance, tempted him with a salary of more than twice his professional pay at Pavia, together with free maintenance for himself and a household of five, and he would also have been permitted to take fees from the courtiers and others. This offer, incidentally, had been made first to Vesalius, the anatomist. He, however, was prosperous, and had other plans in view. He passed the offer on to Cardan, with whom he was friendly (although they never actually met).

Money never really tempted him. While he was poor he gambled, but his mind was never warped by the desire for gain. He therefore refused these offers and turned his attention to his teaching and the education of his children, who now were without a mother. He realized that his children were growing up without any proper teaching or discipline, since he was absorbed in his work. Worse than that, his friends, or at any rate those with whom he allowed himself relaxation with dicing and singing, were a bad element in the house. He knew this all too well, and his effort to make amends was as pathetic as it was characteristic. He wrote a little Book of Precepts, into which he put what he took to be the elements of wisdom, and this he gave to his children. The book combines piety with shrewdness, and may still be read with interest, if not profit. Here are a few extracts:

It is temerity to beg that God will do for us what we can do for ourselves.

Do not talk to other people of yourselves, your children, or your wife.

Deeds are masculine and words are feminine. Letters are of the neuter gender.

The misfortunes of others, if they do not tell you of them, do not seem to know.

When the mind is perturbed, never deliberate.

Never associate with a stranger on the public road.

Many of the precepts are obviously directed against Cardan's own faults. He concludes his book regretfully: "It is however much easier to know these things than to do them".

Probably the most often quoted incident in Jerome's life is his famous journey to Edinburgh to treat John Hamilton, Archbishop of St. Andrews. I cannot deal with the episode in detail (the letter requesting his help from the Archbishop's physician alone is 10,000 words long) but it has always seemed to me to show Cardan at his best in every respect. There was sound wisdom in his management of what was a difficult case of asthma. It would not be natural if someone nowadays did not see in him a pioneer of allergy, on account of his direction to the Archbishop to avoid sleeping on feathers, and not to eat certain foods. But I doubt if Cardan would have accepted that impeachment. He knew nothing at all of protein sensitivity, and was not even guessing at it. But his grasp of the case as a whole, his understanding of the personality and habits of his august patient, his attention to the tiniest details, were all masterly in the highest degree. So far as the feathers were concerned, Cardan seems always to have disliked them. Amongst the directions in his Book of Precepts for his children he says "Never sleep on feathers".

We also see him at his best as a consultant, neither obtruding his opinion nor conceding his own views. It was one of his characteristics to be extremely moderate and fair in his dealings with his confrères, although he may have been a little crude in manner at times. Describing a public debate once, he says: "I, spitting vigorously as was my wont, mildly maintained my ground".

On his travels he received only honour, and his opinion was eagerly sought. He has left some account of his impressions of the various countries and people he saw, but never seems to have been unduly impressed. Paris he found to be extremely dirty. He even suggests that its alternative name of Lutetia was from the Latin word for dirt, *lutum*. But he admits that there might be other derivations. He liked the English, though in somewhat guarded manner. His chief discomfort in England he says, was his ignorance of the language: "When they opened their mouths I could not understand so much as a word, . . . for they inflect the tongue upon the palate, twist words in the mouth, and maintain a sort of gnashing with the teeth".

To this, however, he added:

"It is worth consideration that the English care little or not at all for death. With kisses and salutations parents and children part; the dying say that they depart into immortal life, that they shall there await those left behind; and each exhorts the other to retain

him in his memory. Cheerfully, without blenching, without tottering, they bear with constancy the final doom. . . .

"The English are faithful, liberal and ambitious. But, as for fortitude, the things done by the Highland Scots are the most wonderful. They, when they are led to execution, take a piper with them; and he, who is himself often one of the condemned, plays them up dancing to their death."

He returned from Scotland in 1553, with his reputation at its zenith. His practice became so extensive that he complains of its interfering with his writing, and he was so prosperous that he says he was overpaid. His prosperity lasted until 1557, when the tragedy which was to embitter the rest of his life had its beginning in the marriage of his eldest son to a woman of evil character. The boy had none of his father's strength of mind or commonsense, and the outcome of the wretched alliance was that he poisoned his wife, for which he was tried and executed. Cardan never fully recovered from what he felt not only as the deepest sorrow of his life, but as an intolerable degradation, and, although in time he went back to teaching and writing and was never in financial want, the spring of his being had been broken. To add to his woes, he was imprisoned for some time, probably for impiety in his writings, but finally was released and was pensioned by the Pope. He occupied himself with his writing till near the end, and finally died at the age of 75.

Something must be said about his writings, for it is by them that we know him. They not only show us what he was like but they contain a picture of the life of the Middle Ages which is unsurpassed by any writer of his time.

Cardan rested his fame on four books chiefly; his Commentaries on Hippocrates; his Arithmetic; a book on Astrology; and one on Music. Not one of these is read now, nor is likely ever to be. Mathematicians will respect him as a pioneer in their department, but our only reason for turning back to his medical work would be to get an idea of the teaching of medicine in the middle of the sixteenth century.

All these four are completely sterile compared with the colour and warmth of his autobiography, written in his 75th year, his *De Vita Propria Liber*. It is classed amongst the great autobiographies, and for our purpose of understanding his personality little more is needed. A good translation is now available.

For a complete account of him, however, we must turn to his life by Henry Morley (1854). Morley's industry has provided us with a survey of Cardan's multitudinous writings by which we can judge of his liveliness of mind. Cardan had the knack of being as interesting to his own generation as to ours, although of course ours is the interest of inquisitive retrospection. He writes about the management of households, describing such details as the carrying of fire from one room to another by the servants; the marking of household linen with

secret devices to prevent its theft at the laundry; the construction of special locks to betray anyone opening them by stealth, also a contrivance for securing bedroom doors. He speaks of the practice of locking people into their houses at night as being inconvenient if in case of illness it was necessary to send for help. He describes his habit of keeping all writings addressed to him, even begging letters. He had four cupboards in his study; one for literary papers; one for bills and money affairs; one for the courtesies and compliments of life; and one for waste.

He burned much of what he wrote, and a great deal also was lost otherwise, but he has left behind him more than one hundred manuscripts, of which less than a quarter have been printed. "A great enquirer for Truth" Sir Thomas Browne says of him, "but too Greedy a Receiver of it. . . . He is of singular use to a prudent reader."

It would be futile in a sketch of this kind to attempt a full estimate of Cardan's personality and achievements. He has been rather harshly dealt with by some earlier authors, but so far as I can find out, later writers have been more generous in their judgments. If his autobiography is the product of an insane mind, as some have thought it to be, one would certainly echo King George the Third's famous wish for a little more such insanity. Eccentricity no doubt he showed in full measure, especially in his later years. He became a familiar sight on the streets of Rome, walking with an irregular gait, queerly dressed, and talking to himself. Who of us might not be expected to indulge in some such oddities in his late seventies, after a life of such stress as was lived by Jerome Cardan?

He may have had nothing to teach us in science, but with all his faults he had a respect for truth, a disregard for gain, and a passion for learning, which were altogether admirable. Even the one incident in his scientific work in which he stands clearly condemned for breaking his word (his piracy of Tartaglia's solution of cubic equations) needs to be read in all its details before the condemnation is final. He had a capacity for making enemies, and, undoubtedly, was not of a pleasing personality, but Morley points out that his writings about others are extraordinarily free from rancour, and he never lost a friend by disloyalty.

A complicated personality he no doubt was, but if he is to be judged we must take into account not only his own circumstances but the conditions and standards of life in the sixteenth century. Cardan himself puts them before us in all their poverty and terrible insecurity. In our own day we shall do well if we can equal his powers of detachment and faithfulness to intellectual ideals. From that point of view alone Cardan is no unworthy object of study.

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CATECHISM IN MEDICAL HISTORY

By Heber C. Jamieson, M.B., F.R.C.P.(C)

Edmonton

QUESTIONS

1. Charms and amulets were used to cure disease by the Anglo-Saxons. How did they differ?
2. What convenience for fracture patients in hospital, invented by Guy de Chauliac, is still in use?
3. Isabella of Castile assisted Columbus in his efforts to find a short sea course to India. What did she do for Military Medicine?
4. When were English doctors first organized for war service?
5. Who suggested a motto for the heart and what was it?

ANSWERS

1. (1) Charm (Fr. charme, a song). The usual charms were sacred words or ceremonies used in the gathering of herbs. They were originally heathen but later Christian. For instance: "If the worm or the bleeding fig (hæmorrhoid) turn downwards, delve round a plant of celandine root and take it with thy two hands turned upwards, and sing over it nine Pater Nosters, and at the ninth, at "Deliver us from evil", snap it up, and take from that plant and from others that may be there a little cupful (of juice) and let the man drink it; and let one rub him at a warm fire; it will soon be well with him".
(2) Amulets were parts of animals or plants, precious stones, and gems engraved with mystical devices.
2. The rope or chain hanging over the bed by which the patient can raise or turn himself. Guy de Chauliac (1298-1368) also introduced white of egg to stiffen bandages. This preceded plaster of Paris.
3. About 1470(?) she ordered the provision of six large tents with furniture, physicians, surgeons, orderlies and medicines for the wounded, and also for those with disease. At the siege of Granada she provided four hundred covered wagons called *ambulancias* to remove the wounded from the field. Added to this she organized a group of skilled nurses to attend the patients.

4. In 1415, Henry V signed an agreement with Nicolas Colnet, his physician, and Thomas Morstead, his surgeon, to care for his army in the expedition of Agincourt. These two engaged a lieutenant and impressed twelve surgeons who received eight shillings a day and their share of the plunder. They formed the Guild of Military Surgeons and it is recorded that a revision of their rules took place in 1435.
5. Bowditch (1871) and Kronecker after experiment declared that the heart when stimulated contracted to the fullest extent or not at all. They suggested the motto "all or none".

Medical Societies

Annapolis Valley

The Annapolis Valley Medical Society, branch of the Nova Scotia Division of the Canadian Medical Association, held its 36th annual meeting at the Nova Scotia Sanatorium, Kentville. A scientific program was presented by Dr. A. F. Miller, Dr. J. E. Hiltz and Dr. V. D. Schaffner, of Kentville, and Dr. H. B. Atlee and Dr. K. A. MacKenzie, of Halifax.

Officers were elected for the coming year: *President*—Dr. A. F. Miller, Kentville; *Vice-presidents*—Dr. O. B. Keddy, Windsor, Dr. H. A. Foley, Canning, Dr. C. F. Messenger, Middleton, Dr. J. R. McCleave, Digby; *Secretary-treasurer*—Dr. R. A. Moreash, Berwick; *Representatives to the Medical Society of Nova Scotia*—Dr. M. R. Elliot, Wolfville, Dr. H. E. Kelley, Middleton.

Camp Sussex Medical Society

The August meeting of the Camp Sussex Medical Society was addressed by Major J. K. Poyntz on "The physical background of x-rays". Several civilian members of the profession in New Brunswick accepted the invitation from this military medical society to join with them in their meeting.

Correspondence

Medicine and the "Irregulars"

To the Editor:

In connection with the proposed compulsory National Health Insurance Act, the undersigned feels that it would be far-seeing as well as just and proper for the medical profession to be willing to have the "irregular" sciences such as osteopathy and chiropractic included within the scope of the Act. After all, the art of healing is too broad for any one branch or science to possess the whole truth and all the implements for the relief and cure of the human body.

It is, of course, an indisputable fact that thousands of people have benefited and do benefit from manipulative treatment, and it is also a fact that the average medical doctor has neither any extensive knowledge of manipulative science, nor the necessary time to devote to carrying it into practice. In other words, it is a specialty and should be treated as such.

Lastly, there is much evidence to show that in the interests of scientific progress it is better to be too inclusive than too exclusive. Life itself will sift the gold from the dross and that which it finds of lasting benefit to the human race will be retained.

I trust that there is nothing unethical in suggesting that it might be a good thing to invite correspondence on this subject of irregular practitioners. Our profession is, I think, apt to take too narrow a view which will certainly be looked upon by the general public as pure selfishness, and even vindictiveness, and will, I believe, in the end work out to our own disadvantage.

HILDA R. WERDEN.

August 11, 1943,
189 King Street,
St. Catharines, Ont.

Special Correspondence

The London Letter

(From our own correspondent)

SOCIAL MEDICINE

On the eve of the appearance of the "White Paper" with the Government's views on a comprehensive medical service for the nation, it has been significant that there has been an outbreak, if that is the correct word, of interest in social medicine.

The Emeritus Professor of Medicine at Oxford, Sir Farquhar Buzzard and the first holder of the new chair of Social Medicine at that University, Professor J. Ryle, have both addressed letters to *The Times*. In effect, they both plead for a broader outlook, with a leaving behind of controversial topics such as a salaried state service for doctors, control of the voluntary hospital system and so forth. Let us face the fact, they say, that to prevent disease we must attack bad housing, poor food, imperfect hygiene, the prevalence of dirty habits and ignorance of health matters among other things. In other words, poverty and bad environment are at the root cause of much ill health of mind and body. We must develop as doctors a social conscience and be prepared to deal with or get dealt with by the appropriate authority, these obvious social evils.

But this point of view is not easily accepted. The keen clinician says he cannot teach social medicine at the bedside and the well-established

doctor speaks of social medicine as a misty ambiguity or a political catchword. It is, of course, neither, but the use of such phrases indicate the opposition to any change. It is certain that a comprehensive health service will mean nothing unless it clearly takes note of the need for improving social conditions, and the enlightened in the profession will look more closely for recognition of this in the Minister of Health's suggestions than for details of rates of pay or the constitution of local authorities.

A CHARTER FOR MIDWIVES

After nurses—midwives: that is the order in which the Rushcliffe Committee has been dealing with mainly the financial aspects and the status of these two callings. Some say that it is the wrong order, for midwives play a most essential part in the health of the nation and at a stage in life when there is still great scope for preventive work, to lower the infant mortality rate and especially the neonatal mortality rate to what has been achieved elsewhere.

Under the new report the midwife is to have a distinctive uniform (when coupons permit!), a better salary, a more ordered life (the 96-hour fortnight), with some chance of leisure, to have 28 days' leave a year with pay and substantial sick pay. It is hoped with these better inducements that there will be an increase in those willing to practise, for there is still a great shortage and many who take the "CMB" qualification (Central Midwives Board) never exercise their right to work at this important national job. But perhaps the greatest task is to persuade the public of the great importance of those who do, in fact, preside over the delivery of the great majority of the births in this country. A better status would bring at once more eager recruits, and at any rate the new terms of service are a step in the right direction.

APPEALS AND THE GENERAL MEDICAL COUNCIL

The attitude of the general public to the General Medical Council, according to the popular newspapers, is to regard it as a malevolent autocrat, ruining doctors by striking them off the Register for trivial complaints. Two recent legal actions have, however, cleared the air, for they have served to show exactly how the G.M.C. does in fact act. In the House of Lords a doctor successfully appealed to have the erasure of his name annulled on the grounds that the Council had not made "due enquiry". He had been cited as a co-respondent in a divorce suit in which it was alleged that the woman was a patient. The Council accepted the divorce proceedings and took action. The House of Lords has ruled that they should have heard witnesses and listened to the doctor's defence. In this instance the Council acted in regard to "infamous conduct in a professional respect".

The second case concerned a felony in which the doctor, having been struck off the Register,

appealed before the Lord Chief Justice to have his name restored because of alleged irregularities in the hearing of statements by the police. But the course is absolutely plain and the G.M.C.'s decision has been upheld. A certified copy of a conviction for felony or misdemeanour is all that is required for the G.M.C. to take action. "Infamous conduct", however, demands an inquiry by the doctor's own equals since it is concerned with the "professional respect" which has to be considered.

ALAN MONCRIEFF.

London, September, 1943.

Miscellany

Rehabilitation of a Hand

An interesting example of rehabilitation is reported in the case of Captain Norton A. Fellowes now in the Canadian Army School of Administration at Kemptville, N.S.

In September, 1941, his left hand and wrist were blown off by the explosion of a Vary pistol in his hand. On discharge from hospital Captain Fellowes was equipped with an artificial hand and was classified as C-1. He made such determined efforts to conquer his disability, however, that within six months he was able to use his artificial hand for everything from rowing a boat to handling a rifle. So expert did he become that he applied to have his category raised, but realizing that a mere request in writing would not make much impression on the powers that be, he had a short film made showing the variety of things he could do with his new hand. The equipment allows for the attachment of the mechanical hand, or for such metal appliances as a wrench or a hook. With these he can deal with machinery and drive a car. With his aluminum hand he can write, use a T-square and do a number of small acts such as putting on a respirator and load a rifle. He could also give a useful account of himself in close fighting with his wrench attachment.

His achievements were so strikingly demonstrated that his category has been raised to A-2.

The Artist Looks at Endocrinology

Special deluxe copies of this mural, which appeared in our September issue, are available for distribution on application to Messrs. DesBergers-Bismol Laboratories, 388 St. Paul Street West, Montreal. These are suitable for framing.

University Notes

Dalhousie

Thirty-six young men trod the platform at Dalhousie's special August Convocation to receive the degrees of Doctor of Medicine and Master of Surgery. Eight graduates in Dentistry accompanied them. The address to the graduates was given by Dr. Boris Babkin, of the Physiology Department of McGill, and one time professor of physiology at Dalhousie. Dr. Babkin was awarded an honorary degree of Doctor of Laws. With few exceptions the graduates promptly exchanged their gowns for uniforms in His Majesty's Services.

Abstracts from Current Literature

Surgery

Delayed Closure of Incisions made at Closure of Colonic Stomas. Pemberton, J. de J. and Black, B. M.: *Surg., Gyn. & Obst.*, 1943, 76: 385.

The authors have adopted a delayed suture method of closing colostomy openings and have obtained a satisfying decrease in the incidence of infection following this technique. The bowel is displayed down to its adherence to peritoneum and the skin surrounding the stoma is excised. The stoma is closed and the fascia sutured over the bowel. The method differs in the treatment of the skin and subcutaneous tissues. Deep sutures taking up skin and deep fascia are put in place, but left untied. The wound is packed with iodoform gauze. After 48 hours the gauze is removed and the deep sutures tied, approximating the skin edges. Forty-seven cases of delayed closure are compared with 47 cases of immediate closure, showing in the former group 7 instances of spontaneous faecal drainage against 17, and only one case of failed closure against 7. Incisions, in delayed closure, became infected less frequently and the infections were less extensive.

J. R. LACROIX

Some Manifestations of Regional Ileitis Observed Sigmoidoscopically. Jackman, R. J. and Smith, N. D.: *Surg., Gyn. & Obst.*, 1943, 76: 444.

Little attention has been given to the anorectal findings in regional ileitis. The authors reviewed these findings in 114 cases where diagnosis had been proved by exploration. Three conditions were found to be characteristic: (1) Extra rectal mass, palpable in 17.5%. (2) Anal ulceration and anal contraction, present in 7.8%, due to constant passage of infected ileal contents; (3) anal abscess and anal fistula, present in 31.6%. It is evident from this last figure that every anal fistula must bring to mind the possibility of regional ileitis. The authors do not say whether these abscesses and fistulae develop secondarily to the anal ulceration mentioned above, or are due to the tendency of regional ileitis to fistulization. They imply the latter, though the former seems more probable.

Eight of the cases presented themselves for treatment of fistulae. No other symptoms were present. Six of the 8 were operated on without the regional ileitis being suspected. Discovery came at a later date.

This statistical study demonstrates an important and frequent relationship between Crohn's disease and fistula in ano. Further explanation of the means by which the fistulae become established would be appreciated.

J. R. LACROIX

Papillary Cystadenoma Lymphomatosum of the Parotid Gland. Robinson, D. W. and Harless, M. S.: *Surg., Gyn. & Obst.*, 1943, 76: 449.

Seventy-one cases of this benign tumour have now been reported, of which the last four are here presented in detail with excellent microphotographs. It is now a sufficiently differentiated lesion to be included in textbooks of pathology. The tumour is a small one, 2 to 10 cm. in diameter and slowly growing, which characteristically appears in the lower pole of the parotid gland and so is a tumour of the neck rather than of the face. Other salivary glands have been the site of origin. The origin is probably bronchogenic, although many other theories exist.

The tumour is well encapsulated, nodular and coarsely lobulated. The cut surface is smooth or finely granular, with numerous small cystic spaces containing fluid. The cyst spaces are lined by two or three layers of pseudo-stratified columnar epithelium which may be ciliated. The stroma consists of a delicate reticulum, sometimes collagenous, in which are numerous closely packed lymphocytes or follicles with large germinal centres.

Papillary cystadenoma lymphomatosa occurs chiefly in men of the 5th and 6th decades. It occurs 6 times oftener in men than in women. Average preoperative duration is 6 years. Due to its encapsulation the tumour is easily removed. Only 2 of 71 cases showed evidence of malignant change. Recurrence is quite rare and irradiation therapy is of no value. J. R. LACROIX

Obstetrics and Gynæcology

"Clostridium Welchii" Infections following Abortion. Butler, H. M.: *J. Obst. & Gyn. Brit. Emp.*, 1943, 50: 105.

All the strains of *Clostridium Welchii* causing the severe generalized infections possessed the properties of highly invasive variants and differed from both the strains causing localized infections and those cultivated from the blood of patients without symptoms of a severe *Clostridium Welchii* infection.

In the severe infections the patient's characteristic symptoms were correlated with the properties of the infecting strain.

The comparative rarity of the severe infections was readily explained by the finding that the highly invasive variants of *Clostridium Welchii* formed only a small minority of the strains cultivated from the genital tract.

All the strains causing the severe infections and also some of the control strains produced a fatal infection in guinea pigs when washed cultures from agar were injected intramuscularly. This property was sometimes lost comparatively rapidly under artificial cultivation.

It is suggested that in gas gangrene following wounding a somewhat similar correlation to that observed in abortifacient cases may exist between severity of infection and the characteristics of the infecting strain.

P. J. KEARNS

Tuberculosis of the Female Genital Tract. Browne, O'D.: *J. Obst. & Gyn. Brit. Emp.*, 1943, 50: 128.

Of the 15 cases of tuberculosis of the female genital tract encountered clinically, the following points appear worthy of comment: *Age*.—This averages out at 27 years, but the disease had been in existence for some time before it was detected. *Marriage*.—Seven were married women—2 had been married less than 6 months—and in these moderately acute symptoms had led to their investigation. The remaining 5 patients had been married for at least 2 years, but mostly 4 to 5 years, before the diagnosis had been established. Of these there were 2 parous women who had full-time babies 13 months and nearly 3 years previously. *Symptoms*.—Sterility; transient menorrhagia and other menstrual disturbances; constant lower abdominal pain, with or without backache, and leucorrhœa are the most constant features. Persistent amenorrhœa or menorrhagia were not present, nor was there any one constant symptom nor combination of symptoms. *Preoperative diagnosis*.—

Only 4 correct preoperative diagnoses were made. *Operation*.—Except where there were troublesome symptoms from uterine involvement, either before or after the primary operation, bilateral salpingectomy was usually performed with success and satisfactory results. The ovaries were conserved whenever possible and hysterectomy only employed later when necessary. *Pathological reports*.—Confirmed the diagnosis. *Primary focus*.—Contrary to the experience of others this series, from the clinical standpoint, shows that only 3 of the 15 confirmed cases exhibited any primary focus although every effort was made to detect it either pre- or post-operatively. This is very definitely opposite to general opinion. *Sites of the disease*.—There were no instances of tuberculous cervicitis, vaginitis nor Bartholinitis. Tuberculous salpingitis was more frequent than any other; next most frequently found was involvement of one or both ovaries, while tuberculous endometritis was placed third. *Results*.—All patients continue to enjoy good health without immediate or late complication if sterility be excluded, whether treated by conservative or more radical surgery (salpingectomy with or without unilateral oophorectomy and, or, hysterectomy). This proves nothing, but is strongly in favour of the surgical treatment of the condition. P. J. KEARNS

Pædiatrics

An Agglutinative Reaction for *Hæmophilus Pertussis*.

I. Persistence of Agglutinins after Vaccine. Miller, J. J. Jr., Silverberg, R. J., Saito, T. M. and Humber, J. B.: *J. Pæd.*, 1943, 22: 637.

Agglutinative reactions with *H. pertussis* were performed on the sera of 554 children who had received phase 1 *H. pertussis* vaccine. Two hundred and fifteen of these children were in the age-groups of 6 to 36 months at the time vaccine was given. A total dose of 80 billion *H. pertussis*, divided into three doses, was given within a period of one month. Agglutinins were demonstrated in the sera of all but 5 of the 215 children. The titres attained in from two to four months after vaccination remained relatively constant with no tendency for decline observed up to six years after vaccination. In other groups of vaccinated children, prolonging the interval between the injections had no appreciable effect on the height or persistence of agglutinins. Decreasing the total dose of vaccine to 50 billion cells or lower resulted in much less constant antibody production. Children over 3 years of age at the time of receiving 80 billion *H. pertussis* tended to develop slightly lower "plateaus" of agglutinins than did younger children. Revaccination with a fractional dose one year or more after the initial vaccination led to increases in agglutinin titre which were thereafter maintained at high levels for at least three years.

S. J. USHER

An Agglutinative Reaction for *Hæmophilus Pertussis*.

II. Its Relation to Clinical Immunity. *J. Pæd.*, 1943, 22: 644.

The agglutination reaction has a limited clinical value as a test of immunity. Quantitative tests are essential. High titres indicate successful immunization. Low titres or negative tests on the other hand, do not indicate susceptibility. The relationship between clinical immunity and the agglutinin titre in children given *H. pertussis* vaccine was studied over a period of four years. Periodic tests in a group of 554 children were made. Seventy-nine indoor exposures, 24 of which were familial, occurred. Ten cases of pertussis, 6 from familial exposures, resulted. Among the 69 individuals who escaped, the last agglutinative titre prior to exposure varied from 0 to 1:2,560. Forty-six had titres of 1:320 or higher. Among the ten individuals who were attacked with pertussis, the pre-exposure titres varied from 0 to 1:160. These observations suggest that whereas immunity may exist in the absence of demonstrable agglutinins, susceptibility does not occur.

in the presence of agglutinins in high titre. The authors suggest one revaccination with a fractional dose one to two years later.

S. J. USHER

Oto-Rhino-Laryngology

Nervous Disorders of Swallowing. Hurst, A.: *J. Laryn. & Otol.*, 1943, 58: 60.

Hysterical dysphagia is rare and can only develop in the paralysis of the voluntary muscles concerned in the first two stages of swallowing as the food passes through the bucco-pharyngeal cavity. It does not develop in the oesophagus or the cardia where the swallowing process is independent of voluntary movement. Dysphagia is also seen in organic nervous diseases as a result of paralysis of muscles concerned in the first and second stages of swallowing. Such diseases as diphtheria, progressive muscular atrophy, amyotrophic lateral sclerosis, progressive bulbar palsy, and myasthenia gravis frequently have paralysis of the muscles concerned in swallowing. In all these conditions the feeding of foodstuffs of a porridgy consistency is helpful, as fluids require too rapid action, and lumps too much power from the swallowing mechanism.

The Plummer-Vinson syndrome or the upper dysphagia with anaemia syndrome of Paterson consists of upper dysphagia with atrophic mucosa of the tongue and anaemia. It is due to iron deficiency and is not hysterical as formerly thought. It responds readily to iron and ammonium citrate but if untreated may go on to carcinoma.

The cardiac sphincter fails to relax in the condition known as achalasia. This achalasia or absence of relaxation is due to disease of Auerbach's myenteric plexus. In such cases the weight of a column of food over seven inches high is required to force food past the cardiac sphincter of the oesophagus. The best treatment has been by means of mercury bougies and when they fail, by dilation of the sphincter manually through a gastrotomy.

GUY H. FISK

Anæsthesia

Cæsarean Section under Spinal Anæsthesia. Batten, D. H.: *Cur. Res. in Anæst. & Anal.*, 1943, 22: 143.

The author has previously reported on 96 Cæsarean sections performed under spinal anæsthesia as the method of choice. This communication describes the results in 25 additional patients in which facilities have been available for the determination of the oxygen and carbon dioxide content of the umbilical vein in each of these cases. These data are offered as further evidence that the use of spinal anæsthesia in Cæsarean section is judicious.

Preoperative medication with morphine and scopolamine hydrobromide was employed in almost all cases in the ratio of 25:1. Of course the dosage was adjusted in each case to the mother's requirements, but the ratio between the drugs remained constant. The average dose employed was morphine gr. 1/6 and scopolamine gr. 1/150 given subcutaneously ninety minutes prior to the beginning of the surgery. There were a few cases in which preoperative medication was not given; diabetics were one group which did not receive it.

Ephedrine sulphate 50 mgm. was given five minutes before the administration of the spinal. A pontocaine-procaine mixture was the spinal anæsthetic agent used in all patients. The amount varied from pontocaine 10 mgm. and procaine 50 mgm. to pontocaine 20 mgm. and procaine 50 mgm. The duration of anæsthesia was adequate in all cases with no supplementary anæsthesia required. There was moderate headache in two cases afterward.

During the operation, as soon as spinal anæsthesia had been administered, the patient received continuous inhalation of pure oxygen either with the oronasal or nasal type of B.L.B. mask. Samples of blood from the umbilical vein were obtained at the moment of delivery and analyzed for oxygen and carbon dioxide content.

As these investigations were continued, it became apparent that the inhalation of oxygen in high concentration by the mother was reflected by an increase in the oxygen that was being brought to the baby via the umbilical vein. In this series receiving the oxygen inhalations, no baby stood in need of resuscitation. Each was pink in colour when born and all cried spontaneously as soon as the head was delivered from the uterus.

The advantages of spinal anæsthesia in Cæsarean section are (1) a quiet operative field; (2) a rapidly contracting uterus producing minimal uterine bleeding; (3) retention of the pharyngeal reflex with attendant safety from tracheal aspiration of vomitus; (4) a pink, freely breathing baby even in the presence of maternal sedation.

The danger of extensive cerebral damage occurring in children because of fetal oxygen want as a result of a poorly administered inhalation or intravenous anæsthetic should be entirely eliminated through the use of spinal anæsthesia and the maternal administration of oxygen in high concentration. F. ARTHUR H. WILKINSON

Pathology and Experimental Medicine

Pinealoma. Russell, W. O. and Sachs, E.: *Arch. Path.*, 1943, 35: 869.

Russell and Sachs review 51 cases of pinealoma from the literature, and to these add 7 cases of their own. They reserve the diagnosis "pinealoma" for primary growths of the pineal body which reproduce pineal tissue and contain both the large and small types of cells as seen in the normal pineal at birth; they reject from their series all reported cases which do not fill these criteria (e.g., glioblastomas and ependymomas, etc. of the pineal body). The histogenesis of the two types of cells and the criteria for diagnosis are discussed, as well as the general features of the tumour under the headings of incidence with relation to age and sex, symptoms, rate of growth, gross appearance and behaviour, microscopic appearance, treatment and prognosis.

The findings of greatest significance are that 88% of the cases occurred in males between the ages of 15 and 25 years, and that the majority of the observed symptoms are due to blockage of the aqueduct of Sylvius with resultant internal hydrocephalus, and to frequent involvement of the corpora quadrigemina (headaches, vomiting, disturbances of vision and the inability to look upwards). Evidence from the clinicopathological study of this series is applied to the question of whether the pineal body has a function, and in what way its tumour may be concerned with the production of precocious puberty. Of the series of 58 cases, 17 were at or below the age of 15 years, and of these only 3 showed associated precocious sexual development. It is pointed out that other tumours of the pineal than pinealoma, and even tumours and non-neoplastic lesions involving the hypothalamus, are occasionally associated with precocious sexual development even though the pineal body may not be affected. The only other endocrine disturbance observed in the series was diabetes insipidus, a condition known to be associated with hypothalamic lesions. Thus the authors conclude that pinealoma is not a functioning tumour and that "the mechanism for the production of precocious sexual development associated with intracranial tumours is not directly concerned with pineal tumours or with the pineal body itself, but is inherent in the mid-brain structures (probably the hypothalamus), because all types of tumours primary in the pineal body as well as of tumours in adjacent structures have been at times accompanied by precocious sexual development."

It is finally pointed out that because of the location of pinealomas and because of their tendency to spread and metastasize through the central nervous system, complete operative removal is rarely possible and the prognosis is very poor. The most important conclu-

sion is that the study "offers no support for the concept that the pineal body is some form of endocrine gland".

MALCOLM B. MACKENZIE

Hygiene and Public Health

The Caries-fluorine Hypotheses and a Suggested Study to Test its Application. Bernard, D.: *Pub. Health Rpts.*, 1943, 58: 857.

The literature on endemic fluorosis and its relationship to dental caries is reviewed. Most authors who have studied the matter, find a lower incidence of dental caries among children exposed to fluorine in the drinking water than in non-exposed children. Exposure to fluorine in concentrations greater than 1 part per million (p.p.m.) of drinking water eventually produces mottling of the dental enamel. In 1939 Dean, of the U.S. Public Health Service, reported a study of 4 cities in Illinois. Two of them used water containing 1.8 and 1.7 p.p.m. of fluorine and in these two the number of carious teeth per 100 children was 201 and 205 respectively. In the other two cities the fluorine content was 0.2 p.p.m. and in these cities the caries rate was 401 and 633 per 100 children. Another study by Dean was even more suggestive. This was of the town of Bauxite, Ark. Twelve years before the study the town had used water containing 12 p.p.m. of fluorine. The children who had used this water all showed mottling of the dental enamel. Children, born after the town had secured a fluorine-free drinking water showed no mottling. Dental caries was much greater in the latter group.

Experiments with rats seem also to show the inhibiting effect of fluorine on dental caries although there has been some dispute on this point.

Since the prevention of dental caries is admittedly a most important matter, the author suggests a controlled study of the influence of fluorine. It is suggested that two towns be selected comparable with respect to size, racial composition, age composition, climate, etc. The towns should normally have a fluorine content of less than 0.1 p.p.m. in the water. One of the towns should be used as a control, the other should have fluorine added to the water to make the concentration 0.8 p.p.m. The study would have to extend over a period of more than 10 years.

FRANK G. PEDLEY

Experiments on Carbon Monoxide Poisoning in Tents and Snow Houses. Irving, L., Scholander, P. F. and Edwards, G. A.: *J. Indust. Hyg. & Tox.*, 1942, 24: 213.

In the past there have been occasions when explorers in Arctic regions have been overcome in their tents supposedly from fumes of carbon monoxide from their heaters. No actual examination of the air had been made. Tents, if well banked with snow and covered from condensation of water vapour from within, may become practically air-tight and easily permit fumes to accumulate in toxic concentrations. The possibility of poisoning under these conditions has very practical importance at the present time since conditions of war may require men to live in temporary shelters under very cold temperature conditions. The experiments described in this paper deal with conditions which were designed to simulate tent life in winter. Measurements were made of carbon monoxide in the blood of people who had remained in tents and snow houses with primus stoves burning. Two types of tents were used; one made of light cotton duck water-proofed with paraffin but somewhat porous; the other of a plastic material which was practically air tight.

Observations in the cotton tent after burning a primus stove for 2 hours showed that the CO concentration in the blood had risen slightly but not significantly. Sufficient oxygen remained to support combustion of stove and lights. In the plastic tent after the primus had burned for one-half hour the candle went out and the wood of matches would not ignite. CO saturation of the blood reached 16%.

Although none of the experiments indicated the presence of dangerous quantities of CO, the possibility that they might accumulate cannot be ignored, particularly after the defective operation of stoves.

FRANK G. PEDLEY

Obituaries

Dr. Walter Earl Ackland died on August 13, at Ottawa, in his 44th year.

Dr. Ackland was born in Ottawa, the son of Mrs. Ackland and the late Harry Ackland, and was educated in local schools. Graduating in medicine at Toronto University (1927), he interned at the Ottawa Civic Hospital. He opened his practice in Richmond in 1929 and soon became one of the leading men of his profession in the locality.

Dr. Alice J. Anderson, of the Mission Hospital, Indore, Central India, died on July 30, 1943. She was a graduate of the University of Toronto (1919).

Dr. Joseph Ayotte, Plantagenet, Ont., died on June 17, 1943. He was a graduate of Laval University, Quebec (1903).

Dr. William Arthur Brown, of Kingston, Ont., died in January, 1943. He was born in 1868 and a graduate of McGill University (1891).

Dr. Edward Patrick Byrne, Carleton County coroner since January, 1942, and a popular physician and surgeon in Ottawa for the past 26 years, died on July 16, at the Ottawa General Hospital following a series of heart attacks. He was in his 59th year and had been in hospital for more than a week.

Dr. Byrne was born in Kingston and graduated from Queen's University in 1908, following which he began medical practice in Ottawa. In the absence on military service of Dr. R. M. Cairns, he was appointed coroner in 1942.

He was well known in all sections of the Capital and his loss will be keenly felt by all those with whom he came in contact for his understanding and appreciation of the worth of his fellow men was an outstanding characteristic.

He is survived by his widow and two daughters.

Major J. C. Calhoun. Assistant to the District Medical Officer of M.D. No. 4 in 1941, and latterly specialist medical officer at the Army Reception Centre here, Major Calhoun died on September 11, after a short illness. He was 57 years old. Major Calhoun served throughout the Great War, and returned to Canada in 1918 with the rank of lieutenant-colonel. He had been associated for over 20 years with the Toronto General Hospital, prior to his appointment to M.D. 4 in 1941.

He is survived by his widow, and a son overseas.

Dr. Hugh McCulla Cooke died on September 6 at his home in Toronto from a heart seizure. Dr. Cooke had been active as a medical practitioner in Toronto for 37 years.

A pioneer resident of Forest Hill Village, where he had made his home since 1925, Dr. Cooke had been closely allied not only with municipal affairs in the community but the County of York as well. Elected a councillor for Forest Hill Village in 1931, he received an acclamation as deputy reeve in 1932 and as reeve in 1934. He resigned the office of reeve in 1935 to accept the appointment of Commissioner of Hospitalization for York County.

Dr. Cooke was born in Carleton Place and graduated in arts at Ann Arbor, Mich. Following graduation in medicine from the University of Toronto in 1904, he spent two years in Labrador, where he was medical inspector for a pulp company. Coming to Toronto in

1906, he established a medical practice with offices at 38 Carlton Street, which he maintained until his death. Dr. Cooke was a keen curler and member of Victoria Club and the Toronto Curling Club. He was a former member of the Mississauga and the Royal York Golf Clubs. He was a member of the Masonic Order and a past president of the Forest Hill Progressive Conservative Association. He was prominently connected with the York County Children's Aid Society and the secondary school system.

Surviving is his widow.

Dr. Allan J. Davidson died on August 13 in the Winnipeg General hospital after a brief illness.

He was born in Elton municipality in 1890, and moved to Winnipeg in 1911. He graduated from the Manitoba Medical College in 1920 and, with the exception of a few months spent in Birtle, Man., had been practising medicine in Winnipeg since then.

He was a member of the Assiniboine lodge, A.F. and A.M., Scottish Rites and Shriners. Always keenly interested in photography, he was for many years an active member of the local Amateur Cinema club. He was a member of St. Margaret's Anglican church.

A quiet, conscientious, hardworking general practitioner, Allan Davidson was a credit to the profession, and his death is a real loss to the community.

Dr. Davidson is survived by his widow, a son and a daughter; also by his mother, three sisters and one brother.

Dr. Maurice Ray Fargey died on September 1 at Manitoba Sanatorium, Ninette, aged 36. He graduated in Medicine from the University of Manitoba in 1933 and served his internship in St. Boniface Hospital, after which he practised at Bowsman River, Manitoba. He is survived by his widow and a daughter. Burial took place at La Rivière, Man.

Dr. F. H. Hurlburt died following a heart attack on July 29, 1943, after getting out of the plane on his return from a meeting of the Council of the College of Physicians and Surgeons, in Regina.

Dr. Hurlburt graduated from the University of Toronto in 1907. He practised in Lashburn and Battleford and then served in the Middle East. Following the first Great War he took up residence in North Battleford where he has practised ever since. Dr. Hurlburt took a great interest in general medical affairs, being at one time a member of the national executive of the Canadian Medical Association, and was president of the College of Physicians and Surgeons in 1939-40.

For the past twenty-one years he has served on the North Battleford Collegiate Board of which he was chairman for the greater part of that time. Dr. Hurlburt was also a past president of the North Battleford Rotary Club, and was a member of St. Paul's Anglican Church.

He is survived by his widow and one son, Capt. William Hurlburt, now serving with the R.C.A.M.C. in Palestine.

Dr. Michael James died on April 27, at Mattawa, Ont. He was a graduate of Queen's College (1887).

Sqdn. Ldr. J. Grant MacKenzie. A research scientist in aviation medicine, Sqdn. Ldr. MacKenzie, is missing, believed killed while carrying out an important research mission for the R.C.A.F. at an eastern point, according to information received by his wife, who lives at Centre Island, Toronto, Ont. Though no details have been received by his family, it is known that the mishap occurred on September 4.

Dr. MacKenzie, who specialized on studying the effects of altitude and vibration on the ears of airmen, had up until two weeks ago been attached to the medical research department at No. 6 I.T.S., Toronto.

Son of Mr. and Mrs. W. L. MacKenzie, of Lucknow, he graduated from the University of Toronto school

of medicine in 1936. After postgraduate work at the New York Ear, Eye, Nose and Throat Infirmary, Columbia University and in Philadelphia, Dr. MacKenzie practised at Madison, Wis.

He is survived by his widow and one daughter.

Dr. Lollard McLeay died on August 13, at Gravenhurst, Ont. He was born in 1870 and was a graduate of the University of Toronto (1899).

Dr. Robert James Manion, of Ottawa, Ont., died on July 2, 1943. He was born in 1881 and a graduate of Trinity University (1904).

Dr. J. Alfred Mousseau, of Montreal; died on September 14, 1943, at the Hotel-Dieu Hospital in his 56th year.

Representing the Province of Quebec and the University of Montreal at the medical congress in Brussels in 1935, Dr. Mousseau became one of the founders of the Gastro-Enterology Society on his visit to Belgium. He received his doctorate in Paris in 1925 after graduating from Valleyfield College and the University of Montreal.

Dr. Mousseau was attached to the medical staff of Notre Dame Hospital for 14 years and later became joint head at the Hotel-Dieu.

Dr. Reginald Sterling Pentecost, of Toronto, Ont., died on August 23, 1943. He was born in 1885 and a graduate of the University of Toronto (1909).

Dr. Hugh Richard Scott, of Preston, Ont., died on April 15, 1943. He was born in 1885 and a graduate of the University of Toronto (1922).

Dr. Ellen Ann Aikins Burt Sherratt, of Gelert, Ont., died on August 22. She was a graduate of Trinity College (1894).

Dr. Duncan J. Sinclair, aged 77, a practising physician in Woodstock, Ont., for more than 50 years, died on August 17. In 1921 he was elected Liberal member of Parliament for Oxford North and held the seat for four years.

A native of Brook, Ont., Dr. Sinclair was educated in Ridgetown Public and High Schools and at Michigan State University, Ann Arbor, Mich. On graduation he took up his practice here.

He is survived by his widow and three sons.

Dr. Letitia K. Meade Sirrs, Walkerville, Ont., died in May, 1943. She was a graduate of Trinity College (1891).

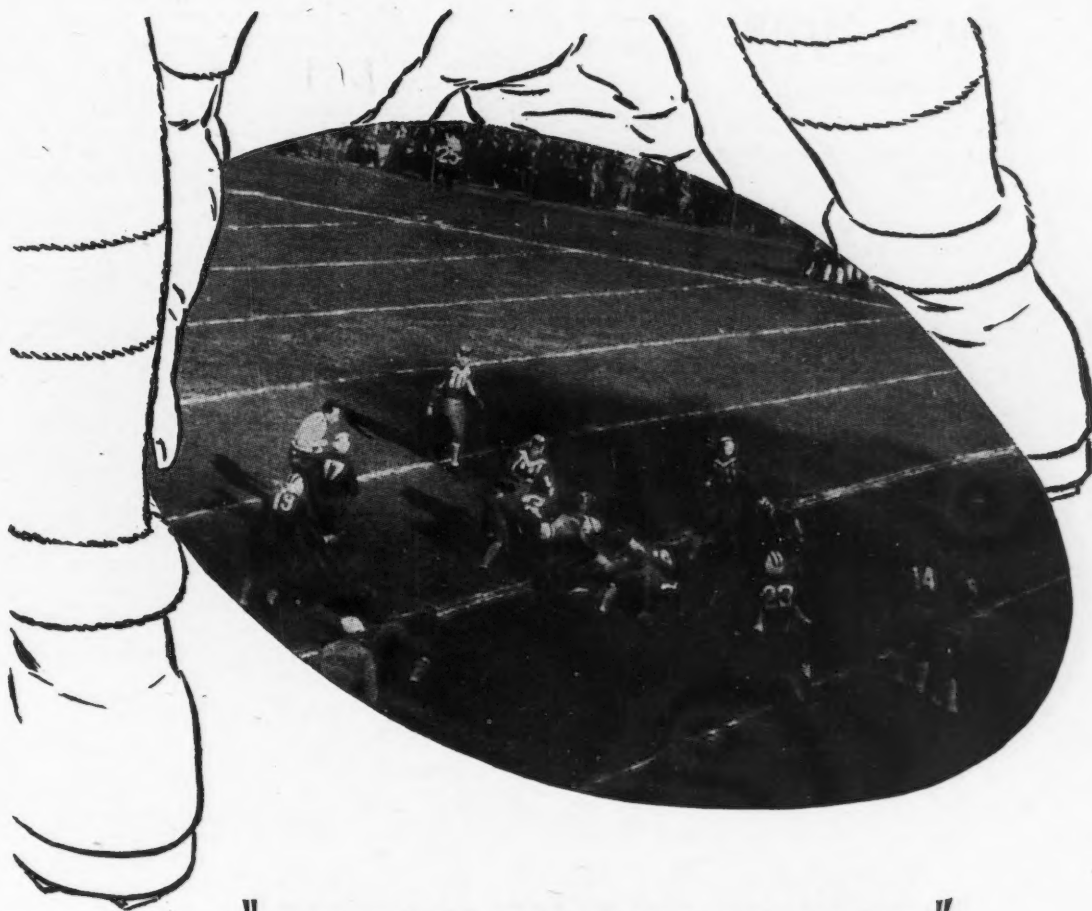
Dr. Alexander Stewart Thompson, aged 84, believed to have been the oldest practising physician in Ontario until his retirement two years ago, died at his home in Strathroy on August 3.

Born in Lobo Township, he practised in Strathroy for 58 years. He was one of the oldest members of the Ontario Medical Association. He was a graduate of Edinburgh University (1884).

Besides his widow he is survived by a son, Stewart, who was captured while serving aboard a freighter and is now a prisoner of war in Germany; also by two brothers.

Sir Beckwith Whitehouse, M.S., F.R.C.S. We note with deep regret, the recent death of Sir Beckwith Whitehouse, President of the British Medical Association. Sir Beckwith had a heart attack after attending a meeting of Council on July 28 and died soon afterwards. He was in his 61st year. Sir Beckwith was an Honorary Member of our Association, and many of us will recall his vigorous, attractive personality. He had a most distinguished career, and has left an abiding mark in his chosen subject of obstetrics and gynaecology.

Dr. T. A. Young, Toronto, Ont., died on January 22, 1943. He was a graduate of Trinity College (1897).



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News Items

Alberta

The University of Alberta expects to establish three periods of instruction yearly, thus courses will be speeded up and the students will get the full instruction.

Health Insurance will occupy the attention of the members of the Alberta Medical Convention in Calgary on September 13, 1943. A series of questions on this subject have been distributed to certain physicians who will speak on them and thus open the discussion on the points raised.

The Public Health Committee of the Canadian Medical Association, Alberta Division, has recommended to the Convention: (1) Province-wide pasteurization of milk intended for sale. (2) More control of venereal disease, especially measures for prevention and public enlightenment. (3) Control of tuberculosis. (4) Increase in health units. (5) Provision for homes of the aged.

The Refresher Course which is sponsored each year by the Alberta Division and the University has proved so successful that the Committee on Education is suggesting that this work be extended so that in the south of the Province they may also have annual refresher courses.

Alberta is, comparatively speaking, a new Province, but during the past year 21 medical registrants have passed away, fifteen of whom were over 60 years of age and seven of these were over three score and ten. Half the men in private practice are over 55 years of age.

The Alberta Tuberculosis Association and the Kinsmen's Clubs have purchased a most up-to-date portable x-ray outfit which they have leased to the Provincial Government for a period of five years, to be used by the Tuberculosis Division of the Department of Health in connection with its campaign to reduce the incidence of tuberculosis in Alberta. It is understood as a commencement that they will x-ray all employees of many industrial concerns, as well as the population of certain definite localities. The machine is powerful, takes small films and can handle 400 persons daily if necessary.

It is to be regretted that the Federal Government did not permit the Provincial Government to get the necessary supplies to erect the \$500,000 tuberculosis hospital on the University grounds, for doubtless much more hospital space will be needed. G. E. LEARMONTH

British Columbia

The annual meeting of the British Columbia Medical Association is over, and a record attendance was reported, nearly four hundred members being present—a large number of the audience wearing uniform, and all three Services were represented. The program was an admirable one, and the speakers were very generous, both as regards the number of papers, and the quality thereof. Perhaps the most significant item of the meeting was the Round Table Conference on Health Insurance and Medical Economics, which was fully attended, and lasted well into the small hours. One cannot but feel that the affairs of the profession are being well handled by the committees set up by the Council of the Canadian Medical Association.

Anterior poliomyelitis has made its appearance in British Columbia, and a few cases have been reported in Vancouver. Fortunately the colder weather is coming, and we are hopeful of avoiding any sort of

epidemic. The paper read by Dr. R. R. Struthers, of Montreal, dealing with the modern views on this disease and its treatment, was particularly timely, and received very close attention. In passing, it is of interest to note the excitement which a single case of diphtheria has aroused in our Health Department here. The disease has become so rare since the introduction of toxoid, that the appearance of a single case is deemed worthy of special mention in the press.

Chlorination of the water supply of Greater Vancouver appears to be well under way, and will soon, we are told, be an accomplished fact. This will close, we hope, what was a rather heated controversy concerning the necessity for such a step, and its possibly deleterious effects upon the health and morale of the community. It is doubtful whether we shall ever notice any difference, but the step is certainly one in the right direction.

The annual campaign for the Community Chests of Canada will begin in a week or so, and it is of interest to note how eager the big firms and public bodies are to endorse and support this campaign, many of them putting full page advertisements in the daily press. The growth of this organization in British Columbia has been extremely steady, and the gradual expansion of its work into the fields of preventive disease and work connected with children and adolescents, has been remarkable, and reflects great credit on those in command.

The druggists of British Columbia, probably no more and no less than their other colleagues throughout Canada, are having a very bad time in several ways. One is the difficulty in obtaining qualified men and women, and we understand that their organization is making representation to the government to obtain relief in this regard. The usual difficulties of transportation and those due to restrictions of one kind and another, are also presenting considerable difficulty. J. H. MACDERMOT

Manitoba

Major Harry Lewis, M.C., a veteran of the World War, has been appointed to the command of Shilo Military Hospital with the rank of Lieut.-Col.

Lieut. Avard I. Fryer has been promoted to Captain in No. 10 Company, R.C.A.M.C.

Winnipeg City Council intends to control mosquitoes. It will ask the provincial legislature to give the council necessary powers. One clause in the proposed amendment to the city's charter forbids householders to allow eavestroughs to become packed with leaves and stagnant water. ROSS MITCHELL

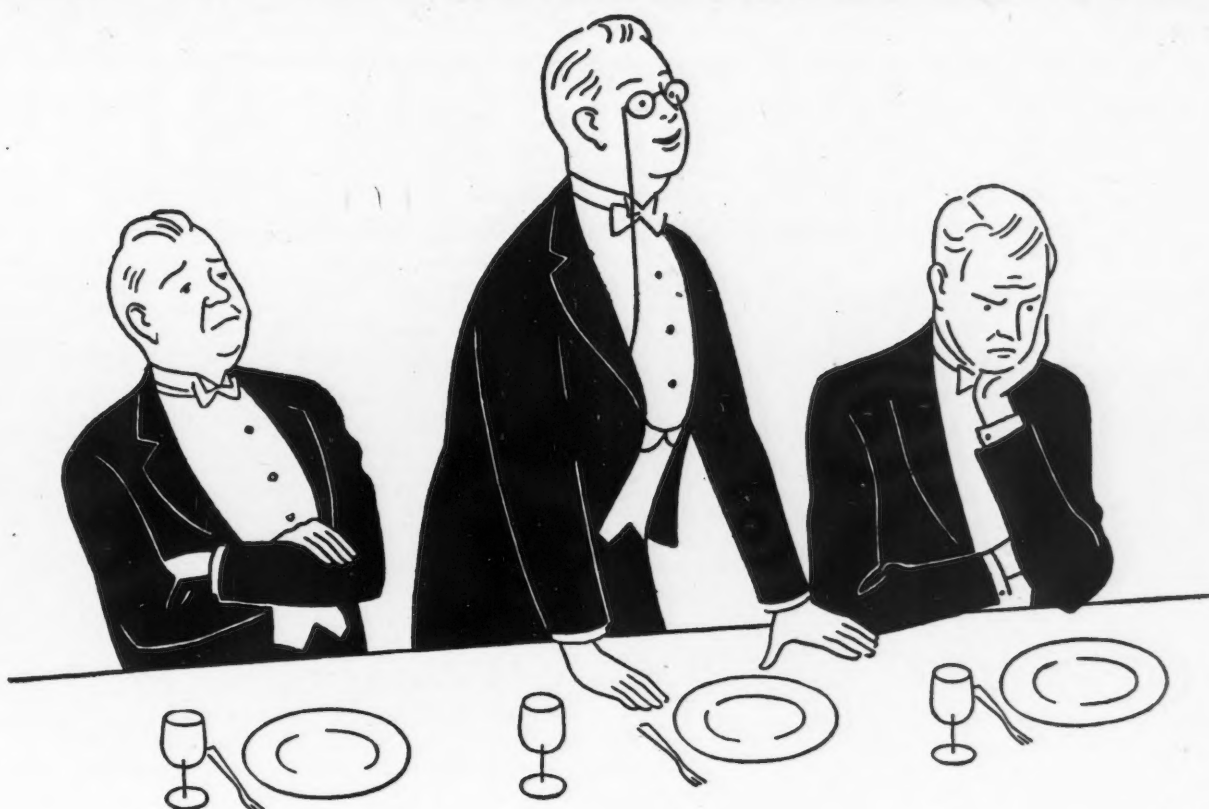
New Brunswick

Dr. C. L. Emerson has been appointed Medical Health Officer for Saint John City. This appointment is for the duration of the war while so many public health officers are on service with the armed forces.

Dr. E. A. Petrie, of Saint John, was the special speaker at the August meeting of the Fredericton Medical Society. Dr. Petrie spoke on "gastro-intestinal diagnosis". His paper was illustrated by slides demonstrating the lesions described.

Capt. Graham Knoll of the 2/14 Field Ambulance is still confined to hospital in Saint John the result of repeated attacks of rheumatism.

The press reports that the City of Saint John is sponsoring a recommendation in favour of state hos-



Postprandial distress

Having to listen to a prosy after-dinner oration may be a painful experience, but more real, in the physical sense, is the distress that awaits him who has dined well but none too wisely.

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pitalization and medical care before the next meeting of the Union of New Brunswick Municipalities.

Dr. George White, of Saint John, and Dr. George S. Skinner, of Saint John, have resumed practice after successful surgical treatment. Both are again in excellent health.

Dr. Richard Monahan, of Saint John, has been made a member of the American Board of Oto-laryngology.

A. S. KIRKLAND

Nova Scotia

Emerging from its three-year wartime eclipse, the Dalhousie Refresher Course will hold its nineteenth session, October 11 to 15. The course comes this year not in spite of the war, but because of it, at the request of Brigadier Meakins, as a brush-up in civilian medicine and surgery to medical men of the Services, who will attend some hundred and fifty strong. Added to the civilian registration, they will probably make up the largest group ever to attend.

Guest teachers will be Dr. H. M. Stander, Professor of Obstetrics and Gynecology at Cornell University, and Dr. Max Peet, Professor of Neurosurgery at the University of Michigan. Dr. Ronald Hare, of Connaught Laboratories, and Dr. Frank S. Kennedy, of the Department of Medicine, University of Western Ontario. Dr. Stander and Dr. Peet come through the generosity and courtesy of the *War-time Graduate Medical Meetings*, formed under the auspices of the American Medical Association, the American College of Surgeons and the American College of Physicians. ARTHUR L. MURPHY

Ontario

The President and President-elect of the Ontario Medical Association, the General Secretary of the Canadian Medical Association and the Secretary of the Canadian Hospital Association made a visit recently to the training centre for medical officers in Camp Borden. The object was to learn what provision for a library of reference books and current journals is being made in this and other training centres. Their report may be anticipated as showing that such facilities do not exist. It is almost certain that steps will immediately be taken to remedy the condition and that books, periodicals and suitable reading rooms will be provided.

The annual district meetings of the Ontario Medical Association have been scheduled for the various dates in September and October. District No. 10 met in Fort William on September 13. On September 15 district No. 9 met in Sudbury. For this meeting a program has been published.

A morning session devoted to discussion of such problems as the Federal Health Insurance Act and the care of soldier dependants, was followed by a scientific meeting in the afternoon. Dr. Wm. Wagner, of Toronto, spoke on the "Pathogenesis of anemia", and Dr. R. M. Wansborough who has recently been recalled from Canadian General Hospital No. 15 discussed the treatment of injuries of the knee. A dinner with a special address was held in the evening. M. H. V. CAMERON

Quebec

Pour la sixième année consécutive, un enseignement libre de la pédiatrie aura lieu du 4 au 9 octobre prochain, sous la direction du docteur Paul Letondal, professeur agrégé de Médecine des Enfants à l'Université de Montréal et pédiatre consultant de l'Hôpital Général de Verdun. Cet enseignement, qui jusqu'ici était consacré aux maladies digestives du premier âge, portera cette année sur la pathologie respiratoire du nourrisson.

Il sera donné à l'Hôpital Général de Verdun par les professeurs agrégés Philippe Panneton et Armand

Frappier, ainsi que par les docteurs Daniel Longpré, Albert Guilbeault, Henri Charbonneau, Albert Jutras, J.-P. Bombardier, G.-E. Pouliot, V. Latraverse, Georges Deshaies, Marcel Verschelden, Georges Manseau, Louis Pilon, Gérard Casgrain, Norbert Vézina et L.-J. Gauthier. Les leçons auront lieu l'après-midi, de 4 à 6 heures, dans la salle du Bureau Médical et seront suivies de projections. Pendant cette semaine, tous les matins de 9 heures à midi, dans les hôpitaux, conférences de séméiologie et de thérapeutique respiratoire avec présentation de malades ou démonstration pratique.

Ceux qui désirent suivre cet enseignement—spécialement organisé pour le médecin en clientèle générale—peuvent s'inscrire dès maintenant en adressant leur demande au directeur du cours de perfectionnement, 418 est, rue Sherbrooke. Droit à verser: cinq dollars. Les auditeurs recevront avant chaque leçon un plan détaillé du cours et un certificat sera décerné aux médecins qui auront régulièrement suivi cet enseignement.

Programme du Cours

Lundi 4 octobre

- 4 h.—Ouverture du cours.—Honorable M. Henri Groulx.
- 4 h. 15.—Introduction à l'étude de la pathologie respiratoire du nourrisson.—M. Paul Letondal.
- 5 h.—Les végétations adénoïdes.—M. Philippe Panneton.

Mardi 5 octobre

- 4 h.—Abcès rétro-pharyngien.—M. G.-E. Pouliot.
- 5 h.—Les syndromes laryngés.—M. Henri Charbonneau.

Mercredi 6 octobre

- 4 h.—L'asthme.—M. Gérard Casgrain.
- 5 h.—L'hypertrophie du thymus et les syndromes médiastinaux.—M. Daniel Longpré.

Jeudi 7 octobre

- 4 h.—Les bronchites et les broncho-pneumonies aiguës.—M. Paul Letondal.
- 5 h.—Les bronchites et les broncho-pneumonies chroniques. La bronchiectasie.—M. Marcel Verschelden.

Vendredi 8 octobre

- 4 h.—Les pleurésies purulentes et l'abcès du poulmon.—M. Georges Deshaies.
- 5 h.—Les oto-mastoidites.—M. Philippe Panneton.

Samedi 9 octobre

- 4 h.—Adénopathie trachéo-bronchique et tuberculose.—M. Albert Guilbeault.
- 5 h.—Coqueluche.—M. Henri Charbonneau.

Programme des Conférences Cliniques

Mardi 5 octobre à l'Hôpital Général de Verdun

- 9 h.—Séméiologie respiratoire. Les troubles fonctionnels.—M. Paul Letondal.
- 10 h.—Exploration radiologique.—M. Albert Jutras.
- 11 h.—Conférence clinique avec présentation de malades.—M. J.-P. Bombardier.

Mercredi 6 octobre à l'Hôpital St-Luc

- 9 h.—Séméiologie respiratoire. Les signes physiques.—M. Paul Letondal.
- 10 h.—Exploration endoscopique.—M. V. Latraverse.
- 11 h.—Conférence clinique avec présentation de malades.—M. Daniel Longpré.

Jeudi 7 octobre à l'Hôpital du Sacré-Cœur

- 9 h.—Les réactions à la tuberculine.—M. Georges Manseau.
- 10 h.—La recherche du bacille de Koch dans le liquide gastrique.—M. Armand Frappier.
- 11 h.—Conférence clinique avec présentation de malades.—M. Louis Pilon.

Vendredi 8 octobre à l'Hôpital Pasteur

- 9 h.—Thérapeutique clinique. L'alimentation et la médication interne.—M. Paul Letondal.
- 10 h.—La médication externe.—M. L.-J. Gauthier.
- 11 h.—Conférence clinique avec présentation de malades.—M. Henri Charbonneau.

IN PREGNANCY

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FOR TREATMENT OF THREATENED
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Tocopherex contains vitamin E derived from vegetable oils by molecular distillation, in a form more concentrated, more stable and more economical than wheat germ oil.

For experimental use in prevention of habitual abortion (when due to Vitamin E Deficiency): 1 to 3 capsules daily for 8½ months. In threatened abortion: 5 capsules within 24 hours, possibly continued for 1 or 2 weeks and 1 to 3 capsules daily thereafter.

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Samedi 9 octobre à l'Hôpital Notre-Dame

- 9 h.—Thérapeutique clinique. Oxygénothérapie. Transfusion.—M. Norbert Vézina.
 10 h.—Les agents physiques.—M. L.-P. Bélisle.
 11 h.—Conférence clinique avec présentation de malades.—M. Albert Guilbeault.

Saskatchewan

Dr. G. W. Cope, who practised for a number of years at Young, Sask., and recently in Saskatoon, is now located at Oliver, B.C.

Dr. J. P. Gussin, formerly of Kenaston, and later of Lestock, has moved to Melville and taken over Dr. E. Angelle's practice.

New members of the College of Physicians and Surgeons of Saskatchewan include: Dr. Charles C. Burkell, a graduate of Toronto in 1941, who is now teaching anatomy at the University of Saskatchewan; Dr. Frederick T. Preston, a graduate of Manitoba 1939, who is now located at Biggar, Sask.; Dr. A. Benjamin King, a graduate of the University of Alberta 1943, who is now with Dr. J. F. Anderson of Saskatoon; and Dr. John D. Anderson, a Toronto graduate of 1936, who is now with Dr. G. J. McMurtry, of Regina.

Dr. G. G. Leckie has returned to his practice at Lucky Lake; and Dr. J. W. Salter and Dr. H. T. Hogan have taken up residence in Saskatoon. All three men have been recently released from military service and are returning to civilian practice.

Other changes on the Saskatchewan medical front are: Dr. D. A. McKay, formerly of Weirsdale, has now moved to Smeaton; Dr. T. F. Waugh to Leroy; Dr. D. W. Ganton, formerly of Mankota, to Ogema, Sask.; and Dr. W. F. Glen, of Central Butte, is moving to Shaunavon; Dr. Glen's practice at Central Butte is being taken over by Dr. E. M. Vessey, who was formerly of Canora.

Saskatchewan medical men have contributed to date \$1,882.00, to the British War Benevolent Fund, which with the contribution of the College of Physicians and Surgeons of \$1,500.00, brings the total amount to \$3,382.00. This fund is expected to continue to grow.
H. D. HART

General

The Board of Trustees of the University of Illinois have announced the acceptance of a grant of \$25,000 a year for three years made by The Upjohn Company of Kalamazoo, Michigan, to be devoted to the academic study of the structural composition and possible synthesis of penicillin.

The Company's present grant, says F. W. Heyl, Ph.D., Vice-president and Director of Research, provides for an enlarged three-year research chemistry project under the direction of Professor Herbert E. Carter of the department of biochemistry at Urbana, Illinois. This, says Heyl, amplifies both an earlier co-operative research project at that school and the bacteriological and other research which is being conducted at the Company's laboratories at Kalamazoo.

The College of Physicians of Philadelphia awarded the Alvarenga Prize on July 14, 1943, to Ernest Carroll Faust, Professor of Medical Parasitology, and Acting Head of Department of Tropical Medicine, Tulane University, for his outstanding contributions to our knowledge of parasitology and tropical medicine.

This prize was established by the will of Pedro Francisco Da Costa Alvarenga of Lisbon, Portugal, an Associate Fellow of the College of Physicians, to be awarded annually by the College of Physicians on

each anniversary of the death of the testator, July 14, 1883, to the author of the best memorial upon any branch of medicine, which may be deemed worthy of the prize.

King's Birthday Honours.—In our recent list of the King's Birthday Honours we omitted to mention the following:

Dr. G. B. Reed, Professor of Bacteriology, Queen's University, Order of the British Empire.

Captain C. E. Egan, R.C.A.M.C., Kingston, Member of the Order of the British Empire.

American-Soviet Medical Society President Honoured by Russian Academy of Sciences.—Dr. Walter B. Cannon, president of the American-Soviet Medical Society, was formally inducted as a member of the Academy of Sciences of the U.S.S.R. at a reception given in his honour by the Soviet Embassy on August 12. Dr. Cannon, who is professor emeritus of physiology at Harvard, is the first American to be a member of both the Academy of Sciences of the United States and that of the U.S.S.R. In conferring the honour, the Academy of Sciences of the U.S.S.R. stated that they were "profoundly confident that the hour is not far off when we Russian, British, and American scientists and our colleagues in other countries will meet at an international congress to share scientific achievements which will have helped bring back peace and freedom to humanity."

The American-Soviet Medical Society, which Dr. Cannon now heads, has been organized to stimulate the exchange of medical information between this country and the Soviet Union. Dr. Cannon has done much to encourage this exchange. A paper he delivered several years ago before the International Congress of Physiologists in Moscow met with great acclaim.

The national headquarters of the society are at 130 West 46 Street in New York City. The American Review of Soviet Medicine, its publication, maintains editorial offices at 1900 East Monument Street in Baltimore.

Two other American scientists, Dr. Ernest O. Lawrence, professor of physics, and Dr. Gilbert N. Lewis, professor of chemistry, both at the University of California, were similarly honoured.

Book Reviews

Vaginal Hysterectomy. J. W. Kennedy and A. D. Campbell. 495 pp., illust. \$12.50. F. A. Davis, Phila., 1942.

As a comprehensive and detailed exposition of the technique of vaginal hysterectomy by both the clamp and ligature method, this volume is an undoubted contribution of value to gynaecological literature by authors who write with the authority of great experience.

The subject is exhaustively considered in terms of historical background and, particularly by the senior author, with reference to its indications and advantages as contrasted with abdominal hysterectomy, the place of which he virtually relegates to those instances where the vaginal operation cannot be safely performed.

As an exposition of the actual performance of the clamp method of vaginal hysterectomy, the illustrations and accompanying text deserve commendation and render the book of great value.

In Part 3, Dr. A. D. Campbell precedes a clear description of vaginal hysterectomy by the ligature method, with an unusually concise and understandable description of the anatomy concerned, both in the performance of the operation and with regard to the factors involved in the development and repair of genital prolapse. Here again the illustrations are excellent and the descriptive text clear and most easily followed.

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A full discussion of the symptoms, complications and sequelæ of genital prolapse and of the important requirements of pre-operative investigation and preparation of the patient contributes to the thoroughness and general value of this section, as does a careful consideration of post-operative care and a frank exposition of post-operative complications and their treatment.

This book will do much to broaden the use and improve the performance of an operation which has, until recently, not enjoyed the extent of application which it undoubtedly deserves. It is to be hoped that it will not create a reckless enthusiasm for a procedure which, however valuable a place it may hold in the armamentarium of the gynaecological surgeon, is yet possessed of certain limitations and accompanied by its own peculiar indications and hazards. It should enjoy its rightful place, and in their undoubted contribution to the attainment of such, the authors have cause for congratulation. The book is worthy of careful and critical study by all those engaged in gynaecological surgery.

A Textbook of Pathology. W. Boyd. 4th ed., 1008 pp., illust. \$11.50. Lea & Febiger, Philadelphia; Macmillan, Toronto, 1943.

Cette quatrième édition présente des modifications considérables. D'abord, elle est plus courte de 56 pages, ce qui paraît vraiment extraordinaire. L'auteur a pu réussir cette diminution, ainsi qu'il l'indique, "through a tightening of the belt of speech". Le chapitre "The Body Constants in Disease", a été complètement omis, de même que les chapitres sur l'immunité et l'hypersensitivité, sur les principes de l'hérédité.

Plusieurs sujets ont été ajoutés, dont voici les principaux: la vitamine K et l'héparine et leur relation avec la thrombose, l'actinobacillose, le liposarcome, la nécrose hépatique au cours des brûlures, le lupus érythémateux disséminé, la pneumonie à virus, l'appareil rénal juxta-glomérulaire, le rein et l'hypertension, le facteur Rh dans l'érythroblastose, la maladie de Wernicke et les lésions des disques intervertébraux.

Plusieurs chapitres ont été transformés, tels que: l'étiologie des tumeurs, les cirrhoses du foie, (pourquoi pas simplement les cirrhoses?) le goitre, l'obstruction intestinale aiguë, la physiologie pathologique de la rate, les néphroses, les facteurs étiologiques du cancer du sein, la sclérose artérielle, l'étiologie de l'athérome des cholécystites et du diabète, la pyélonéphrite, la pathogénie de la pneumonie franche aiguë lobaire, la péricardite constructive, l'endométriase, l'étiologie de la polyomyélite, les blessures du cerveau.

Ce livre, destiné aux étudiants, est d'une lecture agréable. La présentation des faits s'accompagne parfois de mots amusants, de comparaisons originales qui donnent à ce précis d'anatomie pathologique un caractère personnel que l'on ne rencontre pas dans les précis modernes du même genre, de langue anglaise. L'auteur n'a tenu compte que des notions essentielles. Il s'exprime en une langue claire et simple qui plaît singulièrement aux lecteurs de langue française. Bien qu'il soit écrit en anglais, nous avons recommandé ce précis à nos étudiants de langue française, surtout depuis qu'aucun livre ne vient de la France subjuguée.

The Principles and Practice of War Surgery. J. Trueta. 441 pp., illust. \$7.50. Mosby, St. Louis; McInsh, Toronto, 1943.

Surgeons who, some years ago, first read of Dr. Trueta's work, were of two groups: the skeptical who believed no wound locked in plaster to be safe, and the mildly resentful who saw in it little new beyond the notoriety it was receiving. Both groups will find satisfaction in Dr. Trueta's new book. The soundness of the method he establishes physiologically and pathologically, as well as statistically; and he makes clear that it is not of his own devising, except in its details. He is not the discoverer but a pioneer who found the method, disused in his country, who had

the courage and wisdom to apply and develop it amid the carnage of the Spanish Civil War.

Early in the work Dr. Trueta establishes what the thinking surgeon has already observed for himself, that this is surgery patterned on nature's own way of healing.

In chapter II the author finds some of the principles of the biological treatment in the works of Hippocrates. He finds them, again, appearing here and there through the centuries, often to be stamped down by the Galenists. He finds them rising once more with the work of Lister, and pays full tribute to his two more immediate predecessors, Friedrich and Winnett Orr.

Important in the chapter on gas gangrene is the realization that absence of blood borne oxygen, not the direct atmospheric oxygen, is the great activating factor. Chemotherapy appears as a fitting adjunct to the biological treatment. The technique of wound cleansing, excision, drainage and immobilization is detailed, precise and clear. Primary suture is placed in its proper niche. Shock, anaesthesia, blood transfusion, burns, amputations, skin grafting—the whole field of war surgery make up Dr. Trueta's book.

Dr. Trueta writes as a crusader, rather than as the acknowledged master of his art. With every physiological, pathological and surgical opportunity he presses home the logic of his method. His writing is simple and direct. Because its problem is the healing wound, the book goes even deeper than the problems of war to this greatest of surgical fundamentals. Dr. Trueta's work may well stand as one of the classics of surgery.

Physiology in Aviation. C. L. Gemmill. 129 pp., illust. \$2.75. Thomas, Springfield; Ryerson Press, Toronto, 1943.

The author is instructor in physiology, School of Aviation Medicine at Pensacola, Florida, and the material is that upon which he bases his lectures at that school. Writing primarily for those intimately connected with aviation medicine, he visualizes the flight surgeon in the same relationship to flying personnel as is the engineer to flying matériel. Eighteen concise chapters, clearly illustrated, deal with the physical laws which concern the subject and discuss the physiological responses of the human organism to them. Special emphasis is placed on the mechanics of respiration, anoxia, aeroembolism, acceleration and the temperature and pressure effects of high altitude. The reviewer is happy to note the emphasis put on Paul Bert's "La Pression Barométrique", an English translation of which is now available. The nineteenth chapter, written by Lieut. F. B. Lee, deals with instrument flight and describes the development of new visual reflexes to govern orientation and the sensation of accelerated motion. All phases of the subject are dealt with briefly and descriptively, and are remarkably free from technicalities. The factor for pKa (p. 48) should be 6.1 and not 6.01. The reviewer feels that Chapter XIV dealing with the circulation could be clarified by two or three simple diagrammatic illustrations. This little book is "required" reading for all those interested in aviation medicine and for those seeking information on the fundamental aspects of this subject.

Blood Groups and Transfusion. A. S. Weiner. 3rd ed., 438 pp., illust. \$10.25. Thomas, Springfield; Ryerson Press, Toronto, 1943.

The addition of 124 pages of new material in the new edition reflects the rapid progress made in this field of investigation during the past four years. In revising the book the author has rewritten numerous sections adding new illustration and tables. The chapters dealing with blood groups and subgroups, specific group substances in the various organs of the body, sources of error in typing, and reactions and complications following transfusions have been extended, and a separate chapter has been devoted to the transfusion of stored blood, plasma and serum.

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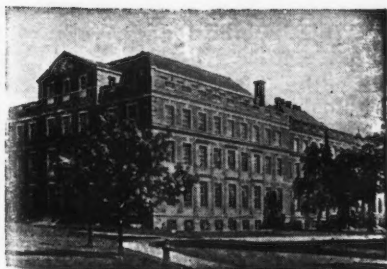
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A new chapter has been included also on the factors Rh and anti-Rh of human blood. The frequently dangerous implications of these factors in pregnancy, and their etiologic rôle in erythroblastosis fetalis, still-birth and in reactions from repeated transfusion, are discussed in the appropriate sections. For a thorough understanding of the nature of the blood groups and their significance in hæmotherapy this book continues to be the paramount source of reference.

Control of the Common Fevers. Edited by R. Cruickshank. 361 pp., illust. 12s. 6d. The Lancet Ltd., 1942.

There is no marker to indicate where actual preventive medicine leaves off and where clinical medicine begins. In this working manual, the authors are thoroughly alive to the value of the full use of preventive measures, but also recognize that concentration on treatment is always effective in prevention. Mention is made of the added dangers from mass movements of populations because of invasions, dispersals and evacuations, shelter life and the migration of refugees all due to war. The droplet or "drop nuclei" is put forward as the great single disseminator of these diseases although all methods are described. Back of all methods of prevention stands good nutrition and good hygiene—*mens sana in corpore sano*. The book then gives a collection of articles dealing with individual diseases, discussing in each case the cause, bacteriology, pathology, immunization and its scientific treatment. Splendid articles are included on Streptococcal Infections, the Common Cold and Rheumatic Fever.

The Kenny Concept of Infantile Paralysis and its Treatment. J. F. Pohl and E. Kenny. 368 pp., illust. \$5.00. Bruce, Minneapolis, Minn., 1943.

This is the first attempt by a medical man to describe Sister Kenny's methods in an orderly manner and in a form that will be readily understood by any practitioner of medicine. It is well written and all the details are minutely described so that any medically trained person can repeat Sister Kenny's exact technique. The clarity of the book is undoubtedly due to Dr. Pohl's incisive mind and it should go a long way to dispelling the emotional objections to the treatment that have arisen, due perhaps to clashes of personality rather than diversity of aims.

The text confines itself mainly to the treatment as empirically developed by Sister Kenny. A chapter however is devoted to the description of the disease, infantile paralysis, as it now appears in the light of Sister Kenny's observations on its symptomatology. The theoretical pathology and physiology of this almost new disease of "spasm and mental alienation" is briefly discussed and several research problems outlined.

The outright condemnation of both the pool and respirator treatments, while justified by the results shown, is perhaps a little hasty and will offend some who heretofore pinned their faith to these forms of treatment. There is no doubt that the respirator has been abused and that it should be avoided in those cases showing spasm, but it still has some value in the rare case of pure flaccid paralysis.

The classification of muscles presented which is based on function rather than anatomical position is a valuable part of the book and fills a much needed want. This section will prove of great use to anatomists, physical therapists, and surgeons.

All in all one can recommend the book strongly to everyone who has to deal with the disease known as infantile paralysis. It represents the greatest advance in this disease in the past twenty years.

Clinical Laboratory Diagnosis. S. A. Levinson and R. P. MacFate. 2nd ed., 980 pp., illust. \$11.50. Lea & Febiger, Philadelphia; Macmillan, Toronto, 1943.

It is stated in the preface that this book has been written for the benefit of student, intern, practising physician and technician but it is not inconceivable that each of the prospective beneficiaries will feel

somewhat slighted when the contents are closely examined for the fulfilment of this statement. No matter to what extent he is ultimately disappointed the purchaser will find himself in possession of a book of some 980 pages in which the paper is good, the subject matter well arranged, the illustrations helpful, and verbosity at a minimum.

The chief criticism of the work should be that too much is attempted. Most of the diseases within the orbit of internal medicine are taken up and almost every aspect of these diseases from the diagnostic standpoint is given some notice. By trying to put the greatest amount of information into the smallest possible space it was inevitable that clarity would be sacrificed for brevity, with the result that some sentences and statements are meaningless for the average reader. Nor will irritation be altogether absent when the text is searched for the information which the impressive table of contents suggests will be found there. However, if the reader will keep in mind that there is a limit to what can be put in one volume and that the views expressed can be no more than the author's present opinions—opinions which are on the whole sound—on the usefulness of current clinical and laboratory tests, he will find the book valuable for reference. And it is mainly because of this value that it can be recommended not only to the laboratory worker but also to the general practitioner.

Manual of Industrial Hygiene and Medical Service in War Industries. Edited by W. M. Gafafer. 508 pp., illust. \$3.50. Saunders, Philadelphia; McAinsh, Toronto, 1943.

This book is a compilation by various authors all of whom, save one, are on the staff of the United States Public Health Service. It is divided into three parts. Part 1, Organization and Operation Facilities, is concerned chiefly with the organization and administration of industrial health services. Part 2, Prevention and Control of Diseases in Industry, deals principally with the control of industrial environment including fatigue, but there is a fairly full discussion of venereal disease, tuberculosis, upper respiratory diseases and other conditions common to industrial workers but not strictly occupational. Part 3, Manpower Problems, considers such problems as absenteeism, women in industry and other matters relating to the maximum use of manpower.

The editing of the book is good. Useful bibliographies are attached to most of the chapters although some have none. It is probably better to issue a book of this sort using a variety of writers, since the subject is too broad to be covered adequately by a single author. The multiplicity of writers, of course, results in an unevenness of treatment. Very few important omissions were noted by the reviewer. No reference could be found to compressed air illness and the absence of typical record forms is perhaps a defect.

With the rapid development of industrial health services and their administration by men who have had no experience in this type of work there is a great need for a book of this sort. It can be recommended unreservedly.

Preventive Inoculation. W. P. Phillips and C. W. Anderson. 74 pp. 6s. "The Practitioner", London, 1942.

"The Practitioner" Booklets edited by Sir Humphry Rolleston, Bt., and Alan A. Moncrieff, cover a variety of subjects and are published by Eyre & Spottiswoode. "Preventive Inoculation" is a clear statement of the status of this procedure in inducing passive or active immunity in a number of diseases. Short chapters deal with infection and immunity, general application of the principles of immunity in prophylaxis, technique of injections, diphtheria, tetanus, scarlet fever, typhoid and paratyphoid fevers, whooping-cough, measles, influenza and the common cold and some notes on prophylaxis in other diseases. It is all done in 74 pages, which include a well done index and a bibliography. Despite its brevity, it is adequate and it is warmly recommended.